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PROCEEDINGS OF SOCIETIES.

KANSAS ACADEMY OF SCIENCE.

FURNISHED BY PROF. E. A. POPENOE, SECRETARY.

The eleventh annual meeting of the Kansas Academy of Science was held in Topeka, October 8th and 9th. The evening of the 8th was occupied by Prof. Mudge, of Manhattan, in a lecture upon "The Rocky Mountains and their Fossils," in which the Professor gave the geological explanation of the various configurations noticed in a general survey of the geology of that interesting region. He minutely described the South Park and the Florissant Basin from a geological point of view, remarking upon the semi-tropical character of the insect and plant life of the latter, as evidenced in the splendid fossils of the shale beds. The lecture was delivered in the usual pleasant and attractive manner of the speaker, who can always have an appreciative audience in the West.

At the day session on the 9th, the following persons were made members of the society: Hon. D. B. Long, of Ellsworth; Prof. George Stearns, of Washburn College; Mr. Parker of Robinson, Kansas; Mrs. N. C. McFarland, of Topeka; Mrs. Campbell and Miss A. E. Mozley, of Wyandott, and Hon. D. M. Valentine of Topeka.

The Secretary's report for the past year noted the receipt of a large number of the publications of other societies for the library of the Academy, and also the

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donations to the museum. The programme was taken up and papers read in the order given below.

Prof. B. F. Mudge spoke on the connection between the Fossil Forests of the Dakota Group of Kansas with the Fossil Forests of Greenland, showing the great similarity between now extinct forest trees of Greenland and some of those in the fossil beds of Western Kansas, and also certain species now living in the Southern United States.

A paper on certain Kansas minerals was then read by Prof. G. E. Patrick, in which he stated that he had carefully assayed several of the supposed silver-bearing rocks from Wilson county, but failed to find a single trace of the precious metal. He also stated that true magnesian limestone is not found in large quantities in this State, much of the so-called magnesian limestone containing less than one-half of one per cent. of magnesia. In speaking of the crystallized gypsum in Western Kansas, Prof. Patrick stated that the two different forms of the crystallized gypsum occur in separate localities. These two forms are the true crystal and the foliated or leaf-like crystal. The former occurs abundantly in the Saline River Valley, near Russell and in a few other localities. The gypsum crystals and veins occur in ledges of blue shale and are supposed by Prof. Patrick to originate on the evaporation of water holding in solution magnesium sulphate, which abounds in Western Kansas, and bi-carbonate of lime derived from the limestone everywhere present, when it passes through the shale near the face of the ledge in which they are found. This theory is supported by the fact that many veins of gypsum disappear at a distance of about two feet from the exposed face of the shale.

In the course of the discussion on Prof. Patrick's paper, Prof. Mudge remarked that there was no proof of the occurrence of metamorphic rocks in Kansas, and consequently, statements of discoveries of the precious metals in the State were to be discredited, as the metamorphic rocks are the mineral-bearing rocks.

A rep rt on the year's additions to the list of Kansas Coleoptera was then read by E. A. Popenoe, in which about three hundred hitherto undetected species were named. Some question having arisen as to the practical value of a list of beetles to the State, Prof. Snow mentioned a statement noticed in an eastern paper, that since Kansas could show so large a list of beetles it was probably a good State to live in rather than the contrary; reasoning that where so many insects could be found, the plant life must be correspondingly abundant and varied, and consequently the soils for the proper nourishment of plants, native and cultivated, correspondingly rich.

It was adduced that the formerly noxious Colorado potato beetle is now beneficial rather than injurious, having left the potato for a wild species of *Solanum*, the bull-nettle or Santa Fé bur, which noxious weed is undoubtedly checked in its spread by the beetle. A list of additions to the list of Kansas plants was read by Prof. J. H. Carruth, which increased the number to about eleven hundred and fifty, and still further additions may be looked for.

In a paper on the Dermal Covering of the Saurians of Western Kansas, Prof. Snow described fragments of the fossilized skin of this reptile dlscovered by him

in Gove county during the past summer. The fragments discovered show a scaly skin like that of a snake, the scales being a very little smaller than those of a prairie rattlesnake. The fossils are so perfect that the minutest structure of the scales is perfectly preserved, and the skeleton, with which the skin fragments were found, denotes an animal of about twenty-five feet in length.

The paper following related the experiences of a member of the Academy, who was bitten by a rattlesnake. The treatment adopted was that of extracting as much as possible of the venom by suction, and applying a ligature above the wound, by which the poison was prevented from entering the system.

Prof. G. E Patrick gave the result of his examination on the so-called "alkali" of Western Kansas. Prof. Aughey, of Nebraska, has found true alkalies in the soil of that State, but the observations of the speaker have resulted in no such discovery in reference to Western Kansas. The white efflorescence on the soil, after evaporation, was determined to be Epsom Salts, or magnesium sulphate, 99 per cent., and sodium sulphate, 1 per cent. The taste of the "alkali" water is that of the magnesium sulphate. No effervescence is shown when treated with acid, as would be the case were the efflorescence a true alkaline carbonate.

Judge F. G. Adams read an interesting notice of the existence of Indian mounds in Kansas. These remains of the work of the Mound Builders were first discovered by Mr. McCoy, many years ago, while missionary to the Shawnee Indians, who then occupied Eastern Kansas. Some of the mounds were rediscovered, and a few of them excavated by Judge Adams and Mr. R. J. Brown of Leavenworth, resulting in finding some remains of the extinct race of Mound Builders. The bones were so nearly decayed that they could be, with difficulty, prererved.

In his addition to the list of Kansas birds, Prof. Snow named five species as newly found to inhabit the State. These are Sprague's Lark and Lewis' Woodpecker, discovered at Ellis, by Dr. L. Watson, and Yellow-crowned Night Heron, Blue Goose and the Common Tern, discovered in Southeastern Kansas by Colonel N. S. Goss, of Neosho Falls. The list now includes three hundred and two birds, and it is expected that this total will be increased to three hundred and twenty-five in a few years. He here displayed the life-size figure of the skeleton of a fossil bird from Western Kansas. The skeleton stood six feet high, and its bill was armed with sharp teeth.

Dr. Thompson's paper on "The Antiquity of Man" was then read, in which it was shown that the problem of the antiquity of man must now be considerad from a geological standpoint. Although the Egyptians are a very ancient people, yet their history as a people is included in the present geological age, while skeletons of low forms of savages have been found in rock deposits which were formed at least one hundred thousand years ago.

A paper describing the huge extinct reptiles, *Dinosauria*, was read by Prof. Snow for the author, S. W. Williston, of Yale College. The dimensions of the largest skeletons show an animal of, in some cases, fifty feet in length. In the

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vicinity of these are found skeletons of others of the same family, only twenty inches long.

Prof. Lovewell described the form of rain gauge used by him at Washburn College, and claimed, on good grounds, that he gained more absolutely correct results with this form of gauge than could be obtained with the ordinary form. This rain gauge is the invention of Prof. Nipher, of Washington University, St. Louis.

Mr. Savage described the lower jaw of a mastodon found in a clay bank along the Wakarusa, near Lawrence. No other remains were found in this locality, but Prof. Wm. Wheeler, of Ottawa, reported the finding of a portion of tusk, about six inches in diameter, in his vicinity. A careful search would probably disclose further specimens in the Eastern portion of the State.

Marcus Sayler, of Lawrence, read an entertaining paper on "Science Popularized," in which he showed that scientific knowledge is becoming a necessity to the successful prosecution of any branch of business. Science is knowledge systematically arranged. The artisan or the farmer who studies the scientific bearings of his pursuit will be the most successful.

As to the objection made by some of the materialistic tendencies of the study of science, the speaker claimed that no truer knowledge of the Creator could be obtained than through the study of his works and laws. Scientific education should begin in common schools, and the simplest principles of natural history should be taught to beginners. Thus would knowledge be gained and good mental discipline obtained at once.

A list of the fishes of the Maries des Cygnes river was read by the President in the absence of the author, Prof. Wm. Wheeler, of Ottawa.

This list includes nearly the same species as that published by Prof. Snow in the Fourth Agricultural Report. In the course of remarks upon the food fishes in Kansas, Hon. D. B. Long, Fish Commissioner for Kansas, stated that he would in the course of a few months introduce one hundred thousand California Salmon into Kansas rivers.

In his report on geological Explorations for the year 1878, Prof. Mudge gave a description of the lead and zinc region of Southwestern Kansas. The productive territory is an extent of about forty square miles, in triangular form. The professor will make a very full report in the forthcoming report of the State Board of Agriculture.

A paper entitled "Botanical Notes," read by E. A. Popenoe, gives a list of Shawnee county Plants, and numerous notes on the localities and distribution of Western Kansas plants, with some comparasons between the two plant districts of East and West Kansas.

Prof. C. D. Merrill, of Washburn College, favored the Academy with a pleasant description of Fingal's Cave and Giant's Causeway, two remarkable geological formations in Scotland and Ireland, giving descriptions of the geological features, with remarks on the probable connection between the two, which are similar formations.

Prof. Lovewell, of Washburn College, in a paper on the Electrical transmission of sound, gave a history of the growth of the telephone, from the instrument formed by stretching a piece of sausage skin across the open bung of a beer keg, to the present instruments of Bell and Edison. The Professor is an original investigator in the field of the telephone.

The papers on the programme having all been read, the report of the Committee on Nominations was presented, and the election of the officers, in accordance with nominations reported, resulted as follows:

President, B. F. Mudge; Vice Presidents—J. H. Carruth and Joseph Savage; Secretary, Edwin A. Popenoe; Treasurer, R. J. Brown; Curators, F. H. Snow, B. F. Mudge, E. A. Popenoe.

The following Commissions were also appointed:

Geology—B. F. Mudge, M. V. B. Knox; Chemistry and Mineralogy—W. K. Kedzie, G. E. Patrick, R. J. Brown; Physics—J. T. Lovewell, L. A. Thomas; Zoölogy—F. H. Snow, M. V. B. Knox, Annie E. Mozley; Botany—J. H. Carruth, E. A. Popenoe; Entomology—F. H. Snow, E. A. Popenoe, Geo. F. Gaumer, William Osborn, T. B. Ashton; Anthropology—A. H. Thompson, J. D. Parker, F. G. Adams; Philology—D. H. Robinson, Geo. Stearns; Meteorology—J. D. Parker, J. T. Lovewell; Committee on Publications—B. F. Mudge chairman, Alfred Gray, F. H. Snow; Committee on Local Arrangements—E. A. Popenoe, F. G. Adams, A. H Thompson, Mrs. N. C. McFarland.

In retiring from the chair of the President, which he has held for five successive years, Prof. Snow remarked upon the very satisfactory growth and evident prosperity of the Academy, prophesying for it an increasing reputation and usefulness, and a prominent place among the institutions of the State.

A vote of thanks was offered the retiring President for the unswerving fidelity and indefatigable efforts which he had exercised in behalf of the Academy, after which adjournment was made to the hour of the evening lecture in the Baptist Church.

The evening lecture was delivered by Prof. D. H. Robinson of the State University, who amplified his subject, "The Historical Value of Linguistic Study," in a manner that pleased and entertained every one of the large audience. The subject is one of unusual interest and was well handled by Prof. Robinson, who traced familiar words in our language through various changes back to the original and and often much more expressive word in a language now no longer heard.

He explained also how similarity in the grammatical structure of two different languages pointed to a community of origin, although the resemblance would not show itself in words of like sound. He gave a brief and interesting history of the growth of the present English language, adverting to the different foreign elements that were from time to time introduced, and which modified, in some instances greatly modified, the essential structure.

The lecture was upon a subject fully within the scope of the Academy of Science, and which has received too little attention in the past and deserves fuller recognition in the future.

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After the close of the well written and pleasantly delivered lecture, a vote of thanks was offered by members of the Academy, to the people of Topeka for their hospitality and interest in the meetings; to the officers of the Baptist Church for the use of their building for the evening lectures; and to the daily papers of Topeka for the generous manner in which they advertised the meetings of the Academy. After this the meeting was adjourned subject to the call of the Executive Committee, who are empowered to appoint time and place of next Summer's semi-annual meeting.

The sessions were, throughout, well attended, and the interest was fully equal to that evinced on any previous occasion. The number of papers presented —twenty-five—is a marked advance over the number of any previous year, and it will soon be necessary to hold the meetings two entire days instead of parts of two as at present.

THE COURSE OF NATURE.

BY PROF. SIMON NEWCOMB, WASHINGTON, D. C.

(Concluded from September number.)

When Pallas inspired Diomed with renewed strength, and gave superhuman accuracy to his aim, it was in order that he might be able to pierce his Trojan enemies. Ordinary investigation might fail to show that his hand trembled less than usual as he raised his javelin, but the goddess took care that the last quiver, as the weapon left his hand should be in the direction to send it into the breast of the foe. The utterances of the oracles were determined, not by the past or the present, but by events still in the future. The blazing comet appeared, not in obedience to a chain of causes commencing with the creation, but in order that man might be warned of the coming calamity. When the prayers of the righteous averted the coming storm, the cloud moved aside in order that their fields and houses might be saved, and when they brought down the gentle rain upon the parched fields, the rain fell in order that famine might be averted.

These supposed causes differed from what enlightened minds now understand by the term Providence in being amenable to scientific investigation, and in not being included in the regular chain of natural phenomena. The designs of Providence are inscrutable, but those of Pallas and Juno were not. Careful experimental investigation, such as might have been undertaken by a Helmholtz of that time would have sufficed to show just how Pallas wanted the spear thrown, if the view of the Homeric age was the correct one. When the king died or the enemy was victorious, men thought they knew exactly why the comet appeared when it did.

These views having so far vanished into thin air, I do not see how we can avoid recognizing the reality of the revolution which modern science claims to have made in the views of men respecting the course of nature. And yet, as I have already shown, there are many tendencies in our being which make us unwilling

to admit the revolution, and lead many to look upon the old theory as correct, provided it were only considered as tracing causes to the will of the Creator. On what is this view founded at the present time? Entirely, it seems to me, in ignoring the distinction between the scrutable and the inscrutable, between the seen and the unseen worlds. Science has, to a greater or less degree, banished final causes from the visible universe, but they act with undiminished vigor in the invisible one. Such a translation may not be a great revolution in thought from a theological point of view, but it certainly is from a scientific standpoint, which considers only visible things.

I can readily imagine your asking if teleological causes can be readily considered as absolutely banished from the whole domain of visible nature; if, considering how limited our knowledge, and how vast that part even of the visible universe which we do not know, it is not rash to assert that we know the true theory of nature, even in the field of phenomena. This question may lead us to look a little more carefully than we have hitherto done upon the exact standing of the doctrine of the uniform course of nature according to antecedent causes and the relation of this doctrine to modern scientific investigation. And this leads me to say that it would be entirely unphilosophical to regard the revolution I have described as a scientific discovery or induction. It may be doubted whether the scientific mind is really any less disposed to believe in final causes than the ordinary mind. Nor can the theory that the course of nature is symbolized by the chain of cause and effect, as I have described it, be considered as the product of modern investigation simply, or as belonging especially to the present age. It is a theory which has been, in a limited sphere, recognized by all men at all times. The reason why modern science has so greatly extended its scope is that modern science has acquired a vastly more extended view of nature than has before been obtained. We all know full well that the action of teleological causes has always been ascribed to operations into which human investigation could not penetrate, although their ultimate effects might be plainly seen. Whenever the subject becomes so well understood that the chain of natural causes can be clearly followed, miracles and final causes cease, so far as the scientific explanation of things is concerned. That a ball or spear thrown in one direction would bend its course into an entirely different direction no one ever supposed. Homer never imagined Pallas as changing the course of the javelin after it had left the hand of Diomed. But those states of the nervous system which result in a certain and accurate aim, or in a tremulous or uncontrolled arm, lay beyond the pale of physiological knowledge in the time of Homer, so here it was that the goddess intervened. When nervous action became fully understood the final cause receded and took refuge in some deeper arcanum of our ignorance. Jove was never expected to make thunder and rain without clouds, nor was the falling of the rain ever ascribed to his interference, because every one believed that if the drops were once formed they would fall at once to the ground without any action on his part. But the mixing currents of moist and cool air, and the processes of condensation which leads to the formation of rain and electricity, were not understood, so here

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Jupiter had a chance to work unseen by man. When the mode in which clouds were formed was once understood, the god of thunder left his seat upon Mount Olympus for a more distant abode. From the earliest historic times the man who took a large dose of poison has died, as a matter of course; neither good nor evil spirit had anything to do with it. But if brain disease bereft him of reason the malevolence of an evil spirit was called into account for the result. If the best man now living should draw up plans and specifications for a dwelling, and then try to induce Providence to erect it in a night, complete in all its parts without further action on his part, we should look upon him as not less remarkable for the feebleness of his intellect than for his moral excellence. We should tell him that he was expecting a miracle, and that the age of miracles was past. But, it would not seem absurd should he appeal to Providence for a showery rain to facilitate the growth of his garden vegetables, because the effect would not appear at all miraculous.

It thus appears that the dividing line between mechanical and final causes, as drawn by the human mind in all ages, has not been fixed in any absolute manner, but only near the limits of the knowledge possessed by each generation. Science has extended the line entirely beyond ordinary mental vision, not by introducing any new theory of nature, but by extending the boundaries of exact knowledge, and with them the field in which, by common consent, final causes do not admit of being traced.

The telescope has revealed to us a universe compared with which that known to ancients is but an atom, and geology has opened up to our view a vista of ages in which the lifetime of our generation is hardly more than a moment. And thus, final causes have taken their flight from a vast region in which they before lay hid in obscurity. The fall of a simple drop of rain at any future time, in any other way than that of exact accordance with the chain of causes now and always in operation would be as complete a miracle as would the appearance of a building without the intervention of human hands. You may now ask, have they simply taken refuge in the more distant, but vastly wider circumference which now marks the boundaries of our knowledge, or are we to suppose them entirely banished from nature? This is entirely a question of intuition and not at all of scientific investigation. I have described the scientific theory of nature as not admitting scrutable final causes at all, but as claiming that the law of the falling rock is symbolic of all her operations. But I think this is a view toward which philosophers have alway inclined.

We must alway expect that men will incline to this view in proportion to their familiarity with the material side of nature. At the same time it is evident to all that there must have been a beginning of things, and that nature could not have commenced herself. We have therefore, a wide belt left between the origin of nature and the boundaries of our knowledge in which we may suppose the inscrutable cause to have acted. Here we reach questions of philosophy which lie outside of our field, and which, therefore, we cannot now stop to con-

sider. The exact bearing of the subject will be better understood by condensing the whole in a brief space.

1. When men study the operations of the world around them they find that certain of those operations are determined by knowable antecedent conditions, and go on with that blind disregard of consequences which they call law. They also find certain other operations which they are unable thus to trace to the operation of law.

2. Men attribute this latter class to intelligent anthropomorphic beings, or gods, having the power to bring about changes in nature, and having certain objects, worthy or ignoble, in view, which they thus endeavor to compass. Men also believe themselves able to discern these objects, and thus to explain the operations which bring them about. The objects are worthy or ignoble according to the state of society. In ancient times they were often the gratification of the silliest pride or the lowest lusts.

3. As knowledge advances, one after another of these operations are found to be really determined by law, the only difficulty being that the law was before unknown or not comprehended, or that the circumstances which determined its action were too obscure or too complex to be fully comprehended.

4. Final causes have thus, one by one, disappeared from every thicket which has been fully explored; the question arises whether they now have or ever had any existence at all. On the one hand, it may be claimed that it is unphilosophical to believe in them when they have been sought in vain in every corner into which light can penetrate. On the other hand, we have the difficulty of accounting for these very laws by which we find the course of nature to be determined. Take, as a single example, the law of hereditary descent. How did such a law—or, rather, how did such a processs, for it is a process—first commence? If this is not as legitimate a subject for inquiry as the question "How came the hand and the eye into existence?" it is only because it seems more difficult to investigate. If, as the most advanced scientific philosophy teaches, creation is itself but a growth, how did that growth originate? We here reach the limits of the scientific field, on ground where they are less well defined than in some other directions, but I shall take the liberty of concluding my remarks with a single suggestion respecting a matter which lies outside of them. When the doctrine of the universality of natural law is carried so far as to include the genesis of living beings and the adaptations to external circumstances which we see in their organs and their structure, it is often pronounced to be atheistic. Whether this judgment is or is not correct I cannot say, but it is very easy to propound the test question by which its correctness is to be determined. Is the general doctrine of causes acting in apparently blind obedience to invariable law in itself atheistic? If it is, then the whole progress of our knowledge of nature has been in this direction, for it has consisted in reducing the operations of nature to such blind obedience. Of course. when I say blind, you understand that I mean blind so far as a scrutable regard to consequence is concerned—blind like justice, in fact. If the doctrine is not atheistic, then there is nothing atheistic in any phase of the theory

of evolution, for this consists solely in accounting for certain processes by natural laws I do not pretend to answer the question here involved, because it belongs entirely to the domain of theology. All we can ask is that each individual shall hold consistent views on the subject, and not maintain the affirmative of the question on one topic and the negative on another. My object in presenting the views I have, has been not so much to propound a new theory as to promote consistency of views among the laborers in the scientific field.

ARCHÆOLOGY.

ANCIENT POTTERY FOUND IN MISSOURI MOUNDS.

BY A. J. CONANT, A. M., ST. LOUIS.

The number of vessels of pottery which have been taken from the mounds in Missouri is prodigious, and almost endless in variety. In an instance which fell under my own observation, nearly, if not quite, one thousand pieces were obtained from a single burial mound; and these were of various sizes and great diversity of form and workmanship. Some of the most characteristic examples will be presented as we proceed. The skill displayed by the pre-historic Americans in everything they manufactured from common clay is vastly superior to that of the ancient civilizations of Europe, to which, in other respects many striking similarities may be traced.

From the fact that few articles which are the products of human ingenuity and skill are more enduring than earthen-ware, this class of antiquities, to the archæologist, is very interesting and instructive. The skill and taste displayed in its various imitative forms, in outline and decoration, give us an insight into some phases of domestic life, social condition and æsthetic taste of ancient peoples, which can be derived from no other source. Fragments of pottery, to the archæologist, therefore, are the imperishable leaves of a book, inscribed by the truthful hand of humanity, in legible characters, with the precious records of those feelings and tender sentiments which are recorded nowhere else, and which need no translation. Their value is enhanced so much the more by the fact that we possess specimens of these records from every quarter of the globe, and coeval with the remotest civilizations.

The successful attempts of the ancient Americans to imitate the forms of beasts and birds, which they saw every day around them, evince a contemplation, observation and affectionate communion with nature which fills us with surprise.

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In reference to the superiority of the skill displayed by the Mound-builders in the ceramic arts, to the corresponding civilization of ancient Europe, I can not do better than quote the words of Dr. Foster.*

"In the plastic arts, the Mound-builders attained a perfection far in advance of any samples which had been found characteristic of the Stone and even the Bronze Age of Europe. We can readily conceive that, in the absence of metallic vessels, pottery would be employed as a substitute, and the potter's art would be held in the highest esteem. From making useful forms, it would be natural to advance to the ornamental. Sir John Lubbock remarks that 'few of the British sepulchral urns, belonging to the ante-Roman times, have upon them any curved lines. Representations of animals and plants are almost entirely wanting.' They are even absent from all the articles belonging to the Bronze Age in Switzerland, and I might almost say in Western Europe generally, while ornaments of curved and spiral lines are eminently characteristic of this period. The ornamental ideas of the Stone Age, on the other hand, are confined, so far as we know, to compositions of straight lines, and the idea of a curve scarcely seems to have occurred to them. The most elegant ornaments on their vases are impressions made by the finger nails, or by a cord wound around the soft clay.

"The commonest forms of the Mound-builders' pottery represent kettles, cups, water-jugs, pipes, vases, etc., etc. Not content with plain surfaces, they frequently ornamented their surfaces with curved lines and fret-work. They even went farther, and moulded images of birds, quadrupeds, and of the human form. The clay, except for their ordinary kettles, where coarse gravel is often intermixed, is finely tempered, so that it did not warp or crack in baking,—the utensils, when completed, having a yellowish or grayish tint."

In the group of vessels shown in Fig. 1, while the human faces and heads of birds are crudely expressed, we find much to admire in the tasteful forms of the objects themselves, The flow of their outline, so to speak, evinces a degree of refinement of feeling which could only result from a culture of the sense for beauty, which must have required a long time for its realization. It will be noticed that the mouths or openings were, on all, made at the back side of the head. This seems to have been the uniform practice, whether the head of the vessel was that of man, beast or bird. Sometimes the vessels with vertical openings, are fitted with covers of the same material, with projecting knobs on the top for handling them. Sometimes, again, the smaller jugs, or bottles as they should be called, have nicely-adjusted stoppers. These latter bottles are made of much finer material, and while they are generally quite thin, they are so well baked that they seem to be almost as tough and strong as our own ware. On page 23 of the Eighth Annual Report of the Trustees of the Peabody Museum, a representation of two of these stoppers is given. They are described as "two articles carved from a hard clay slate and carefully smoothed. Their use is problematical, but they so closely resemble lip ornaments as to suggest that they were such." These are now in the "Swallow Collection" of the museum. In its transportation from

*Pre-historic Races of the United States, p. 236.

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Missouri to Massachusetts, the report informs us, many of the articles were so broken as to make their reconstruction impossible. When I had the pleasure of examining this collection, some years since, these stoppers were then attached to the bottles with which they were found. The smaller bottle of the two, Professor Swallow informed me, when taken from the mound, contained a red liquid.

Some of the representations of the human figure are executed with a good degree of fidelity to nature, through all the members; showing that the artist had studied carefully his model, and had evidently labored to tell the truth as he saw it. Some of the human figures have an expression so striking and individual that we can hardly

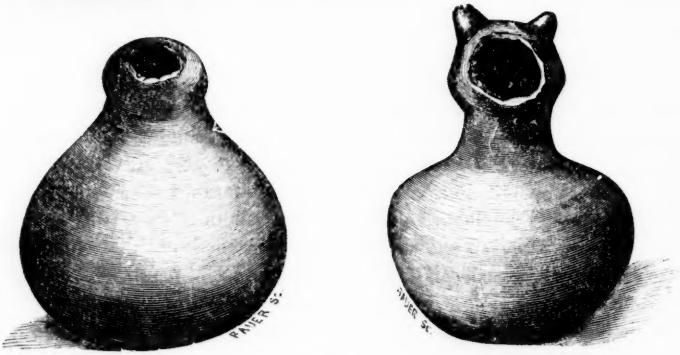

Fig. 1.

believe that they are not portraits. This becomes more probable when we examine the animal representations, or rather the heads of birds, with which the pottery is very often ornamented; particularly those of the different varieties of ducks, in which we observe in the shape of the head, line of neck, etc., the nicest distinctions in particular varieties, which are expressed with remarkable skill. This will be apparent when we come to the consideration of Food Vessels.

Their imitative faculties, as illustrated in their pottery, were certainly remarkable, and to give an adequate idea of the variety of their work in the subjects which might be chosen for illustration would require more space than is allotted to this essay. We proceed, therefore, to consider their cooking utensils. One of the more frequent forms is shown in Fig. 2.

While these vessels were doubtless for common, every-day use, some of

Fig. 2.

them are really quite artistic and graceful. The forms and ornamentation of the others seem to be more experimental, and perhaps transitional, as though the maker varied a little from his usual manner just to see how they would look. It will be observed that all have two or more handles, by which they were probably suspended over the fire by passing through them green twigs, which they covered with moist clay to prevent them from burning. Examples might be multiplied, *ad infinitum*, almost, of this class of vessels, but the above is sufficient to illustrate the inventive powers of their authors in this direction, as well as their constant striving to gratify their æsthetic feeling in the manufacture of those fragile articles which were designed for the commonest uses.

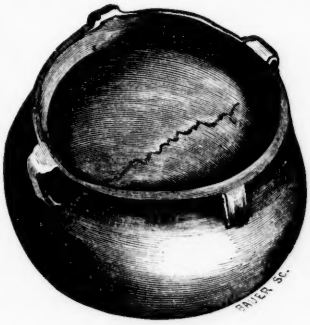

Fig. 3.

Fig. 3 represents a pot very similar to one of the latter, but entirely unique in this, that it contained the upper portion of a human skull and one vertebra. It was taken from a mound near New Madrid, by Prof. Swallow, who tells us that the vessel must have been moulded around the skull, as it could not be removed without breaking the pot. It is now in the Peabody Museum. The top of the skull is shown in the engraving. This is certainly a curiosity. Nothing like it has been found in any other burial mound here or anywhere else, as far as known. It may be remembered, however, in this connection, as before remarked, that small pots have frequently been found in the larger pans, and which contained a decayed shell or fragment of bone. These were, very likely, valued relics or charms which were buried with their possessor.

Fig. 4.

In the next cut (Fig. 4) is presented one of the most common of varieties another and quite different class of bowls. They are peculiar in this: the bodies of of the vessels are entirely devoid of ornamentation. From the edge of the lip on one side projects a small handle; on the opposite side is moulded the head of some beast or bird, and quite often a human head is represented.

The thing specially to be noticed is the diversity of form in the heads of the ducks. So faithfully are the distinctive features of the different varieties delineated, that those at all familiar with them must believe that the artist, according to the best of his skill, conscientiously copied nature. The beautiful curve of the neck and its union with the outline of the vessel itself, could not possibly have been accidental.

The best which these ancient workmen could do is so far inferior to the art of our own times, that it is not easy for us to appreciate the difficulties they must have overcome, their many failures, the long time necessary for the acquisition of those habits of observation, and the development of the skill of hand sufficient to enable them to express themselves as creditably as they have done in all their imitative work. In the class of vessels under consideration, examples decorated with the human head and features are by no means rare. If the credit given them for conscientious observation of nature, and skill in expression of what they saw, is not an over-estimate, then we may believe that, in their delineation of the human face, they also copied nature with a sufficient degree of accuracy to warrant us in the idea that in their work we have at least characteristic likenesses of themselves.

The necessity for condensation demands that here our consideration of this part of our subject should end. The variety and beauty of many of the objects of their fictile skill are very suggestive, and furnish much material for extended generalization. But a remark or two must suffice in this connection. To suppose that all this taste and feeling—this close observation of nature and fidelity in delineation, displayed in the pottery of the Mound-builders, found no expression in any other direction, and was expended upon their domestic utensils alone, is simply incredible. Very different must have been the homes of a people furnished with such tasteful articles, from those miserable huts which the nomadic Indians constructed for their habitations; and it is quite likely that in their dress as well as their dwellings they evinced the same ideas of taste and convenience which we perceive in their domestic utensils. In some of their human effigies we do find the manner of arranging the hair distinctly delineated, and we may yet discover those which shall furnish us with correct representations of their mode of dress. Indeed I have seen one vessel with figures of men rudely painted in outline upon its sides, who were clad in a flowing garment, gathered by a belt around the waist, and reaching to the knees. In this connection I may mention the engraved shells which have frequently been found with skeletons, both in Missouri and Illinois. One of the most interesting was furnished by the late Captain Whitley. When taken from the mound the shell was quite soft and brittle, and easily cut with the finger-nail. The outer edge was much broken or worn away. The design was inclosed by six circular lines, portions of which still remain. On one side were two perforations, designed, doubtless, for the string by which it was suspended from the neck. All similar shells that I have seen are so perforated. It seems quite evident from the picture that it memoralizes the victory of the individual represented as standing over an enemy, who lies on his face at his feet.

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The victor, it will be observed, holds in his right hand a weapon or symbol of authority, with which he seems to be pressing the prostrate figure to the earth. Many of the accessories are unintelligible. While the whole work is very crude, and the figures out of all proportion, there is here and there an outline which shows earnest endeavor; as the leg of the standing figure, for example, in which also the action is so well expressed as to suggest that, by an impetuous onset, he has just felled his antagonist to the ground. The artist seems to have had most difficulty with the eye, or rather, has made no attempt at imitating that organ.

There is now in the museum of the St. Louis Academy of Science, a similar shell, upon which is portrayed, in a creditable manner, the figure of a spider. I have also been shown another by Dr. Richardson, from a mound in Illinois, almost precisely like it, and differing only in a small symbolic device, which is carved upon the back of each. Engraved shells are generally found upon the breast of the skeleton, or in such a position as shows that they were originally placed there, and also where they were probably worn during life. According to Mr. Pidgeon, the spider emblem is perpetuated in the mounds far to the north. He describes one which he saw in Minnesota, about sixty miles above the junction of the St. Peters river with the Mississippi, which covered nearly an acre of ground. Upon ascending its highest elevation, he tells us, it was very evident that the spider was intended to be represented by it. I bring these facts together for the benefit of future observers, without speculating as to their significance, further than to venture the remark that they point to a great diffusion of one people, or their migration from the north, southwardly along the Mississippi valley.—*Commonwealth of Missouri.*

SCIENTIFIC MISCELLANY.

THE AERONAUTIC FLIGHT OF SPIDERS.

Many observations have been made on this singular phenomenon, but hitherto with little success. An English naturalist, the Rev. H. McCook, has for some time past, turned his attention to the subject, and has succeeded in detecting many new details in the performance. Very recently he watched some groups of young wolf-spiders (*Lycosidæ*), which crowded the tops of railings in a meadow. Their faces were turned in the direction from which the wind was blowing; the body of each was elevated to an angle of 45°; the claws brought together and the legs stiffened. From the spinnerets at the apex of the abdomen a single thread was exuded, and rapidly drawn out to a length of several feet by the breeze. Gradually, the foremost pair of legs sank to the level of the wood, and the entire attitude was that of intense resistance. Then, suddenly and simultaneously, the eight claws were unloosed, and the spider mounted, with a sharp bound, into the air, and went careering across the field. As far as could

be judged, the insect seemed to take a voluntary leap at the moment of loosing its hold. One of them, by good fortune, was followed through its flight. The position of the body was soon reversed, the head being turned in the same direction as the wind. The legs were spread out and were united at the claws by delicate filaments of silk. After flying a distance of about eighty feet, the spider gradually settled down on the meadow. The difficulty of these observations will be readily understood, for they require exact suitability of position as to light, the limitation of the flight to a moderate height, and a comparatively slow speed. —*Boston Journal of Chemistry.*

THE PROBLEM OF THE ORIGIN OF LIFE.

And, now, what has become of this most vexed problem of problems—the origin of life? Is not protoplasm a chemical compound like other substances, merely varying from them in its degree of molecular complexity? Its most characteristic manifestation, its distinguishing mode of motion, its peculiar force —the one specific activity constituting its most vital difference—is better known to us than any quality which forms the distinguishing feature between other substances. Do we greatly concern ourselves of the origin of MgO,SO_3+7H_2O, or any other mineral substance? Why, then, should the origin of some combination of C, H, N, O, be made a question of the life and death of our principal philosophies? Has it actually come to this, that the scientific foundation of our creed rests on the decision whether COO is or was once changed into CHO by natural or supernatural means; and this when there is plenty of H about in our world? Yes, it is even so, however incredible, however little flattering to our intellectual pretensions. The contending claims of naturalism and supernaturalism, the fate of the most momentous question touching the guidance of our life, turn actually, in the field of science, upon the paltry issue of the synthesis of ternary carbon compounds, whether this be chemically or whether it be superchemically effected. COO is indisputably an inorganic compound. CHO is indisputably an organic compound. This designates accurately the actual depth of the gulf existing between organic and inorganic Nature.—DR. MONTGOMERY, in *Popular Science Monthly for October.*

FORMATION OF WHIRLWINDS.—In Hebert's recent communications to the French Academy, he has laid special stress upon the influence of the land configurations, and especially of the mountains and valleys, upon the great movements of the atmosphere. He comes to the conclusion that all the cyclones which visit Europe from the Atlantic Ocean originate in the American mountains. Many years ago Professor Henry indicated the region of the Saskatchawan as a prominent cradle of storms. More recent communications to the American Philosophical Society, based partly upon the observations of the Signal Service Bureau and partly upon special meteorological records at San Francisco and at Barbadoes, have shown that there are two other important centers of extensive atmospheric disturbance: one in the neighborhood of Colorado, and another in the West India Islands.—*Jour. Franklin Institute.*

CEOGRAPHY.

CONGRESS AND THE NORTH POLE.

AN ABSTRACT OF ARTIC LEGISLATION IN THE CONGRESS OF THE UNITED STATES.

BY CAPTAIN H. W. HOWGATE, U. S. A., WASHINGTON, D. C.

The recent revival of interest in the subject of Arctic Exploration, in connection with the proposed establishment of a Scientific Colony on the shore of Lady Franklin Bay, under the auspices of the United States Government, naturally awakens a desire to know what part the government has taken in the previous expeditions that have been sent out from the United States to the Arctic for the relief of Sir John Franklin or for geographical exploration and discovery. It is to gratify this desire that I have compiled the series of papers of which this forms the first, from official reports and other public documents through which the records are scattered. I make no attempt at a history of the expeditions themselves, but simply aim to show how they originated and obtained government sanction and aid.

I.

THE DE HAVEN, OR FIRST GRINNELL EXPEDITION.

The first American expedition to the Arctic for other than commercial purposes, and to which the government lent a helping hand, was that known as the First Grinnell Expedition, and inspired by Lady Franklin in her noble efforts to enlist the coöperation of the world in the search for her lost husband. The following message from Gen. Taylor, then President of the United States, to Congress, communicating copies of a correspondence with Lady Franklin on the subject, together with the letters referred to, show the desire of the Executive to respond favorably to the touching appeal, and the cause that had prevented action. The message was read in the Senate January 4, 1850, and referred to the Committee on Naval Affairs and ordered to be printed.

To the Senate and House of Representatives of the United States:

I herewith submit to you copies of a correspondence with the lady of Sir John Franklin, relative to the well known expedition, under his command, to the Arctic regions, for the discovery of a northwest passage. On the receipt of her first letter imploring the aid of the American Government in a search for the missing ships, engaged in an enterprise which interested all civilized nations, I anxiously sought

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the means of affording that assistance, but was prevented from accomplishing the object I had in view, in consequence of the want of vessels suitable to encounter the perils of a proper exploration, the lateness of the season, and the want of an appropriation by Congress to enable me to furnish and equip an efficient squadron for that object. All that I could do, in compliance with a request which I was deeply anxious to gratify, was to cause the advertisements of reward promulgated by the British Government, and the best information I could obtain as to the means of finding the vessels under the command of Sir John Franklin, to be widely circulated among our whalers and sea-faring men, whose spirit of enterprise might lead them to the inhospitable regions where that heroic officer and his brave followers, who periled their lives in the cause of science and for the benefit of the world, were supposed to be imprisoned among the icebergs, or wrecked upon the desert shore. Congress being now in session, the propriety and expediency of an appropriation for fitting out an expedition to proceed in search of the missing ships, with their officers and crews, is respectfully submitted to your consideration. Z. TAYLOR.

WASHINGTON, Jan. 4, 1850.

CORRESPONDENCE.

LADY FRANKLIN TO THE PRESIDENT.

BEDFORD PLACE, LONDON, April 4, 1849.

Sir:—I address myself to you, as the head of a great nation whose power to help me I cannot doubt, and in whose disposition to do so I have a confidence which I trust you will not deem presumptuous.

The name of my husband, Sir John Franklin, is probably not unknown to you. It is intimately connected with the northern part of that continent of which the American Republic forms so vast and conspicuous a portion. When I visited the United States, three years ago, amongst the many proofs I received of respect and courtesy, there was none which touched and even surprised me more than the appreciation everywhere expressed to me of his former services in geographical discovery, and the interest felt in the enterprise in which he was then known to be engaged.

The expedition fitted out by our government for the discovery of the North-west passage, (that question which, for three hundred years, has engaged the interest and baffled the energies of the man of science and the navigator), sailed under my husband's command in May, 1845. The two ships—"Erebus" and "Terror"—contained one hundred and thirty-eight men (officers and crews), and were victualed for three years. They were not expected home, unless success had early rewarded their efforts or some casualty hastened their return, before the close of 1847, nor were any tidings expected from them in the interval. But when the autumn of 1847 arrived without any intelligence of the ships, the attention of her Majesty's government was directed to the necessity of searching for and conveying relief to them in case of their being imprisoned in ice, or wrecked and in want of provisions and means of transportation.

For this purpose an expedition in three divisions was fitted out in the early part of last year, directed to three different quarters simultaneously, viz: 1st, To that by which in case of success the ships would come out of the Polar Sea to the westward, or Behring's Strait; 2nd, to that by which they entered on their course of discovery on the eastern side, or Davis' Strait; and 3rd, to an intervening portion of the Arctic shore approachable by land from the Hudson Bay Company's settlements, on which it was supposed the crews, if obliged to abandon their ships, might he found. This last division of the expedition was placed under the command of my husband's faithful friend, the companion of his former travels, Dr. Sir John Richardson, who landed at New York in April of last year, and hastened to join his men and boats, which were already in advance toward the Arctic shore. Of this portion of the expedition I may briefly say that the absence of any intelligence from Sir John Richardson at this season proves he has been unsuccessful in the object of his search.

The expedition intended for Behring's Strait has hitherto been a complete failure. It consisted of a single ship, the "Plover," which, owing to her setting off too late, and to her bad sailing properties, did not even approach her destination last year.

The remaining and most important portion of the searching expedition consists of two ships under the command of Sir James Ross, which sailed last May for Davis' Strait, but did not succeed, owing to the state of the ice, in getting into Lancaster Sound until the season for operations had nearly closed. These ships are now wintering in the ice, and a store ship is about to be dispatched from hence with provisions and fuel to enable them to stay out another year; but one of these vessels is, in a great degree, withdrawn from active search by the necessity of watching at the entrance of Lancaster Sound for the arrival of intelligence and instructions from England by the whalers.

I have entered into these details with the view of proving that though the British government has not forgotten the duty it owes to the brave men it has sent on a perilous service, and has spent a very large sum in providing the means for its rescue, yet that, owing to various causes, the means actually in operation for this purpose are quite inadequate to meet the extreme exigence of the case; for, it must be remembered, the missing ships were victualed for three years only, and that nearly four years have now elapsed, so that the survivors of so many winters in the ice must be at the last extremity. And also, it must be borne in mind that the channels by which the ships may have attempted to force a passage to the westward, or which they may have been compelled by adverse circumstances to take, are very numerous and complicated, and that one or two ships cannot possibly, in the course of the next short summer, explore them all.

The Board of Admiralty, under a conviction of this fact, has been induced to offer a reward of £20,000 sterling to any ship or ships, of any country, or to any exploring party whatever, which shall render efficient assistance to the missing ships or their crews, or to any portion of them. This announcement, which, even if the sum had been doubled or trebled, would have met with public approbation,

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comes, however, too late for our whalers, which had unfortunately sailed before it was issued, and which, even if the news should overtake them at their fishing grounds, are totally unfitted for any prolonged adventure, having only a few months' provisions on board and no additional clothing. To the American whalers, both in the Atlantic and Pacific, I look with more hope as competitors for the prize, being well aware of their numbers and strength, their thorough equipment and the bold spirit of enterprise which animates their crews. But I venture to look beyond even these. I am not without hope that you will deem it not unworthy of a great and kindred nation to take up the cause of humanity which I plead, in a national spirit, and thus generously make it your own.

I must here, in gratitude, adduce the example of the imperial Russian government, which, as I am led to hope by his Excellency, the Russian Ambassador in London, who forwarded a memorial on the subject, will send out exploring parties this summer, from the Asiatic side of Behring's Strait northward, in search of the lost vessels. It would be a noble spectacle to the world, if three great nations, possessed of the widest empires on the face of the globe, were thus to unite their efforts in the truly Christian work of saving their perishing fellow-men from destruction.

It is not for me to suggest the mode in which such benevolent efforts might best be made. I will only say, however, that if the conceptions of my own mind, to which I do not venture to give utterance, were realized, and that in the noble competition which followed, American seamen had the good fortune to wrest from us the glory, as might be the case, of solving the problem of the unfound passage, or the still greater glory of saving our adventurous navigators from a lingering fate which the mind sickens to dwell on, though I should in either case regret that it was not my own brave countrymen in those seas whose devotion was thus rewarded, yet should I rejoice that it was to *America* we owed our restored happiness, and should be forever bound to her by ties of affectionate gratitude.

I am not without some misgivings while I thus address you. The intense anxieties of a wife and of a daughter may have led me to press too earnestly on your notice the trial under which we are suffering, (yet not *we* only, but hundreds of others,) and to presume too much on the sympathy which we are assured is felt beyond the limit of our own land. Yet if you deem this to be the case, you will still find, I am sure, even in that personal intensity of feeling, an excuse for that fearlessness with which I have thrown myself on your generosity, and will pardon the homage I thus pay to your own high character, and to that of the people over whom you have the high distinction to preside.

I have the honor to be, sir, with great respect,

Your obedient servant,

JANE FRANKLIN.

MR. CLAYTON TO LADY FRANKLIN.

DEPARTMENT OF STATE, WASHINGTON, April 25, 1849.

Madam:—Your letter to the President of the United States, dated April 4, 1849, has been received by him, and he has instructed me to make to you the following reply:

The appeal made in the letter with which you have honored him, is such as would strongly enlist the sympathy of the rulers and the people of any portion of the civilized world. To the citizens of the United States, who share so largely in the emotions which agitate the public mind of your own country, the name of Sir John Franklin has been endeared by his heroic virtues and the sufferings and sacrifices which he has encountered for the benefit of mankind. The appeal of his wife and daughters, in their distress, has been borne across the waters, asking the assistance of a kindred people, to save the brave men who embarked in his unfortunate expedition, and the people of the United States, who have watched with the deepest interest that hazardous enterprise, will now respond to that appeal by the expression of their united wishes that every proper effort may be made by this government for the rescue of your husband and his companions.

To accomplish the objects you have in view, the attention of American navigators, and especially of our whalers, will be immediately invoked. All the information in the possession of this government to enable them to aid in discovering the missing ships, relieving their crews and restoring them to their families, shall be spread far and wide among our people, and all that the executive government of the United States, in the exercise of its constitutional powers, can effect to meet this requisition on American enterprise, skill and bravery, will be promptly undertaken.

The hearts of the American people will be deeply touched by your eloquent address to their Chief Magistrate, and they will join with you in an earnest prayer to Him whose spirit is on the waters, that your husband and his companions may yet be restored to their country and their friends.

I have the honor to be very respectfully, madam,

Your obedient servant,

JOHN M. CLAYTON.

Lady Jane Franklin.

LADY FRANKLIN TO THE PRESIDENT.

BEDFORD PLACE, LONDON, May 24th, 1849.

Sir:—The letter with which you have kindly honored me, conveying the reply of the President of the United States to the appeal I ventured to address him in behalf of the missing Arctic expedition under my husband's command, has filled my heart with gratitude and excites the liveliest feelings of admiration in all who have had an opportunity of seeing it.

Relying upon the reports in the American papers just received, I learn that the people of the United States have responded, as you foresaw they would, to the appeal made to their humane and generous feelings, and that in a manner

worthy of so great and powerful a nation—indeed, with a munificence which is almost without a parallel.

I will only add that I fully and firmly rely upon the wisdom and efficiency of the measures undertaken by the American government. I beg you to do me the favor of conveying to the President the expression of my deep respect and gratitude, and I trust you will accept yourself my heartfelt acknowledgments for the exceedingly kind and feeling manner in which you have conveyed to me His Excellency's sentiments. I have the honor to be, sir,

Your obliged friend and obedient servant,

JANE FRANKLIN.

MR. CRAMPTON TO MR. CLAYTON.

WASHINGTON, June 2, 1849.

Sir:—I have been directed by Her Majesty's government to lose no time in communicating to the government of the United States the printed papers, which I have the honor to inclose herewith, in case an intention on their part, referred to in a statement which appeared in the *Times* newspaper of the 22d ultimo, of sending two ships in search of Sir John Franklin's expedition, is really entertained, it having been suggested by the Lords of the Admiralty that, in that case, it may be useful that the United States government may be in possession of these papers, containing the views of officers competent to give an opinion as to the best chances for affording relief to the expedition, and the steps taken by Her Majesty's government for that purpose.

Her Majesty's government, are, ere this, apprized of the reality of the liberal and philanthropic intention of the President with regard to the expedition in question, which I had the honor of reporting to Viscount Palmerston, in a dispatch dated the 14th ultimo. I have, therefore, the satisfaction of being enabled now to fulfill the instruction which has been addressed to me in anticipation of the correctness of the statement, which had already reached Her Majesty's government, by expressing to you, sir, their full appreciation of the generous and humane motives which have induced the government of the United States to send an expedition to the Arctic seas.

I avail myself of this opportunity to return to you, sir, the assurance of my highest consideration.

JOHN F. CRAMPTON.

HON. J. M. CLAYTON, &c., &c.

REWARDS OFFERED BY THE BRITISH GOVERNMENT.

Three thousand pounds, or a proportion thereof, according to the services rendered, offered by Lady Franklin to such of the whaling ships as shall be generously inclined to assist in the search for Sir John Franklin and his gallant companions.

With the view of inducing any whaling ships that shall resort to Davis' Strait and Baffins Bay to make special efforts in search of the expedition under the command of Sir John Franklin, I hereby offer the sum of three thousand pounds (£3,000) or a proportion thereof according to the services rendered, to

such ship or ships as, departing from the usual fishing grounds, shall discover and if needed, afford effectual relief to the above expedition or any portion of it.

It is proposed that the amount of reward, according to the efforts made and services performed, shall be determined by the following gentlemen, who have kindly consented to act as referees, viz: Rear-Admiral Sir Francis Beaufort, K. C. B.; Captain Sir W. Edward Pany, R. N.; Thomas Word, Esq., (Hull).

In regard to the distribution of the sum awarded among owners, captains, officers and seamen, the amount to each to be adjusted in the same proportions as if similar value of produce had been obtained. In the event of more than one ship making special efforts to give succor to the expedition, each ship is to receive its proportion of the reward agreeably to the decision of the referees.

The attention of whalers disposed to aid in this service is particularly directed to the Gulf of Boothia, within Regents Inlet, or to any of the inlets or channels leading out of Barrow's Strait, or the sea beyond, either northward or southward, as also to any sounds or inlets in the north and western sides of Baffin's Bay above the seventy-fifth degree of latitude.

Should it be clearly proved and ascertained that any whaler has made extraordinary efforts or special researches in quarters remote from the ordinary fishing grounds, for the purpose designated, though no success may have attended their endeavors, the case of such whaler, with a view to reward, will be taken into favorable consideration by the referees.

For the greater satisfaction of parties claiming reward, the owners and captains shall be authorized, if they desire, to nominate one additional referee, who shall act and vote in all respects as the standing referees in the special case for which they may be nominated. The referees, being then increased to four, will, according to the usual order of business, choose for themselves a fifth as umpire.

Twenty thousand pounds sterling ($100,000) reward to be given by her Britannic Majesty's government to such private ships or to any exploration parti s of any country as may in the judgment of the Board of Admiralty, have rendered efficient assistance to Sir John Franklin, his ships or their crews, and may have contributed directly to extricate them from the ice.

The attention of whalers or any other ships or parties disposed to aid in this this service is particularly directed to Smith's Sound and Jones' Sound, in Baffin's Bay, to Regent's Inlet and the Gulf of Boothia as well as to any of the inlets or channels leading out of Barrow's Strait, particularly to Wellington Strait or the sea beyond, either northward or southward. Vessels entering through Behring's Strait would necessarily direct their search north and south of Melville Island.

H. G. WARD. Sec. to the Admiralty.

LONDON, March 23, 1849.

MR. BANCROFT TO MR. CLAYTON.

(*Extract.*)

UNITED STATES LEGATION, LONDON, June 15, 1849.

SIR:— * * * * The newspapers having announced that it is the President's intention to fit out two ships to go in search of Sir John Frank-

lin, the Royal Society have passed a vote on the subject, which the Earl of Rosse, president of the Royal Society, has communicated to me by a letter, a copy of which is inclosed. Not having any official knowledge of the President's intention, I have taken care, when appealed to, to say that I know nothing on the subject beyond what was before the world. You will observe, also, that the subject has engaged the attention of the House of Commons. I was present and heard Sir Robert Inglis, Lord Palmerston and Mr. D'Israeli speak of it in the handsomest manner. * * * * * * *

I am, respectfully,

HON. J. M. CLAYTON, Sec. of State, Washington, D. C. GEORGE BANCROFT.

THE EARL OF ROSSE TO MR. CLAYTON.

13 CONNAUGHT PLACE, June 9, 1849.

MY DEAR SIR:—I have the honor to inform you that at the annual meeting of the Royal Society held the 7th inst., a communication was read from Admiral Sir F. Beaufort in which he apprized the society that the American Government had nobly undertaken to send an expedition in search of Sir John Franklin, upon which a vote of thanks was moved by Sir Charles Lemon, seconded by Lord Northampton, and carried with the utmost enthusiasm, expressive of the gratitude of the Royal Society to the American Government and of their deep sense of the kind and brotherly feeling which had prompted so liberal an act of humanity.

Allow me to assure you that it is peculiarly gratifying to me to have the honor of being the humble instrument in conveying to you the thanks of the Royal Society on this occasion; and permit me to express a hope that this most generous act of the United States may, if possible, draw closer the bonds of friendship between the two kindred nations. That the United States may continue to progress with the same extraordinary rapidity in the arts of peace and civilization, and to hold the same high place in the science and literature of the world is, I am sure, the anxious desire of the Royal Society.

I have the honor to be, sir, very truly yours,

ROSSE.

His Excellency, George Bancroft, Esq.

MR. SMYTH TO MR. BANCROFT.

3 CHEYNE WALK, CHELSEA, June 20, 1849.

DEAR SIR:—Having notified to a general meeting of the Royal Geographical Society of London, holden on Monday the 11th inst., that the government of the United States, with noble feeling and generous liberality, ordered an expedition under the command of a very distinguished officer to assist in the search, in the Arctic regions, for Capt. Sir John Franklin, (late a vice-president of the said society) and his brave companions, it was resolved unanimously to transmit an expression of the society's gratitude to the American Government and their full sense of the benevolent impulse which prompted so admirable an act of humanity.

On so deeply interesting an occasion I beg to be allowed to assure you of the gratification I feel on being made the instrument of this expression, and

Believe me very sincerely your faithful servant,

W. H. SMYTH, Pres. Royal Geographical Society.

His Excellency, Hon. George Bancroft.

LADY FRANKLIN TO THE PRESIDENT.

SPRING GARDENS, LONDON, Dec. 11, 1849.

SIR:—I had the honor of addressing myself to you in the month of April last, in behalf of my husband, Sir John Franklin, his officers and crews, who were sent by her Majesty's government, in the spring of 1845, and who have never since been heard of.

Their mysterious fate has excited, I believe, the deepest interest throughout the civilized world, but nowhere more so, not even in England itself, than in the United States of Amcrica. It was under a deep conviction of this fact, and with the humble hope that an appeal to those generous sentiments would never be made altogether in vain, that I ventured to lay before you the necessities of that critical period, and to ask you to take up the cause of humanity which I pleaded, and generously make it your own.

How nobly you, sir, and the American people, responded to that appeal, how kindly and courteously that response was conveyed to me, is known wherever our common language is spoken or understood, and though difficulties which were mainly owing to the advanced state of the season, presented themselves after your official announcement had been made known to our government, and prevented the immediate execution of your intentions, yet the generous pledge you had given was not altogether withdrawn, and hope still remained to me that, should the necessity for renewed measures continue to exist, I might look again across the waters for the needed succor.

A period has now, alas! arrived, when our dearest hopes as to the safe return of the discovery ships this autumn are finally crushed by the unexpected though forced return of Sir James Ross, without any tidings of them, and also by the close of the Arctic season. And not only have no tidings been brought of their safety or of their fate, but even the very traces of their course have yet to be discovered; for such was the concurrence of unfortunate and unusual circumstances attending the efforts of the brave and able officer alluded to, that he was not able to reach those points where indications of the course of the discovery ships would most probably be found. And thus, at the close of a second season since the departure of the recent expedition of search, we remain in nearly the same state of ignorance respecting the missing expedition as at the moment of its starting from our shores. And in the meantime our brave countrymen, whether clinging still to their ships or dispersed in various directions, have entered upon a fifth winte in those dark and dreary solitudes, with exhausted means, while yet their expected succor comes not.

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It is in the time, then, of their greatest peril, in the day of their extremest need, that I venture, encouraged by your former kindness, to look to you again for some active efforts which may come in aid of those of my own country, and add to the means of search. Her Majesty's ministers have already resolved on sending an expedition to Behring's Strait, and doubtless have other necessary measures in contemplation, supported as they are, in every means that can be desired for this humane purpose, by the sympathies of the nation and by the generous solicitude which our Queen is known to feel in the fate of her brave people imperiled in their country's service. But, whatever be the measures contemplated by the Admiralty, they cannot be such as will leave no room or necessity for more, since it is only by the multiplication of means, and those vigorous and instant ones, that we can hope, at this last stage, and in this last hour, perhaps, of the lost navigators' existence, to snatch them from a dreary grave. And surely, till the shores and seas of those frozen regions have been swept in all directions, or until some memorial be found to attest their fate, neither England, who sent them out, nor even America, on whose shores they have been launched in a cause which has interested the world for centuries, will deem the question at rest.

May it please God so to move the hearts and wills of a great and kindred people, and of their chosen chief magistrate, that they may join heart and hand in the generous enterprise. The respect and admiration of the world, which watches with growing interest every movement of your great republic, will follow the chivalric and humane endeavor, and the blessings of those who were ready to perish shall come upon you.

I have the honor to be, sir with great respect,

Your grateful and obedient servant,

JANE FRANKLIN.

His Excellency, the President of the United States.

LADY FRANKLIN TO MR. CLAYTON.

SPRING GARDENS, LONDON, Dec. 12, 1849.

SIR:—I beg to transmit, through you, to the President of the United States, the accompanying letter, trusting to that same kindness on his part of which you have already been the feeling and eloquent exponent, that it will be received with an indulgence similar to that which I met with before.

Sir John Richardson informs me that the interest felt in the United States for the unfortunate missing expedition under my husband's command is as lively and deep as ever, and in this feeling, and in the benevolent disposition of the President, I place my humble confidence.

I have the honor to be, sir, your obliged and obedient servant,

JANE FRANKLIN.

The expressed sympathy of the government as shown in the above correspondence, met with a hearty support from the press of the country, but from various causes failed to yield practical results and it became evident that if the United States was to share in the search for the lost navigator something more decisive and tangible must be done. In this emergency Mr. Grinnell, of New York, tendered the use of the necessary vessels, in a memorial which was presented in the Senate April 5, 1850, by Henry Clay, as shown by the following extract from the Congressional Globe of that date:

* * * * * * * * *

"Mr. Clay presented the memorial of Mr. Henry Grinnell, of New York, stating that he was fitting out two or three vessels in the port of New York to send out in search of Sir John Franklin,, and requesting the services of certain seamen of the United States under command of subordinate officers of the Navy to give the vessels something of a naval and military discipline, as essential to the success of the enterprise." * * * * *

Mr. Clay referred in warm terms to the high standing and public spirit of Mr. Grinnell, and on his motion the memorial was referred to the Committee on Naval Affairs.

In the course of his remarks Mr. Clay said that he feared Sir John and his companions would not be found alive, but that the attempt to find them would be gratifying to the whole world, and many useful discoveries might be made that would add to the knowledge of the world, and amply repay any expenditure that might be incurred by the United States.

Mr. Clay also presented a petition signed by a great many merchants and citizens of Philadelphia, recommending to Congress the passage of some measure favoring Mr. Grinnell's enterprise.

In the House of Representatives. April 25, 1850, Mr. Stanton, of Tennessee, from Committee on Naval Affairs, reported a joint resolution to authorize the President of the United States to accept and attach to the Navy the two vessels offered by Mr. Henry Grinnell, of New York, to be sent to the Arctic seas in search of Sir John Franklin and his companions, and said it was important that early action be taken.

Objection was made by Mr. Bayly, of Virginia, who referred to it as a "wild goose chase," and moved to lay the resolution on the table, which was defeated by a vote of yeas, 70, nays, 99.

Fears were entertained by the opponents of the measure that Congress would be called upon at some future time to compensate Mr. Grinnell for the use of his vessels, and in reference to this Mr. Brooks, of New York, said: * * "The object of the expedition was not to obtain money from the government, neither *now* nor hereafter, as had been insinuated.

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The projector of the expedition, impelled by the highest influences that could nerve a man, proposed to fit out two vessels costing some $30,000, at his own expense, asking of the government nothing save that it extend over them the protection of its flag and give them the discipline of its Navy. * * * * It was felt and known that a private vessel with sailors enlisted only under our mercantile laws as for the mercantile marine, could not have that discipline on board, that salutary and efficient government which might be necessary in high northern latitudes under the most trying circumstances in which human beings might be placed. To prevent mutiny, to enforce law, to compel if necessary self-sacrifice—the discipline and government of the Navy were wanted, and it was unwise if not unsafe to send two vessels to the Arctic seas for the purpose contemplated with only the discipline of the mercantile marine to govern them. * * * Can you look other nations in the face if you decline to coöperate in this enterprise, and let them have all the honor of exploring even your own North American Continent? * * * With reference to the remark of Mr. Bayly that it was a "wild goose chase," Mr. Brooks said: "I am afraid that all mankind, and especially that portion whom I represent, will not acquiesce in the judgment of the gentleman from Virginia, and will be as earnest as ever to solve the problem. This is an expedition which humanity invokes, which science calls for, which continental pride demands from you, and you alone of all other nations."

After some desultory remarks from various members the subject went over until next day, April 26, when Mr. Stanton advocated immediate action, and was opposed by Mr. Bayly, Mr. Savage, and others, as visionary.

During the discussion, which consumed most of the day's session, considerable sectional feeling was developed, which led Mr. Cable, of Ohio, to offer the following amendment to the joint resolution, which was received with much merriment:

Provided, That neither slavery nor involuntary servitude, except for crime, shall exist in any country or countries which may be discovered by said expedition about the North Pole.

The following extracts from Mr. Bayly's remarks are of interest as showing the feeling at that time against uniting the government with any private enterprise:

" * * * * If it is proper for us to engage in it at all, we ought to do it on our own account and in a manner becoming a great naval and commercial nation. I do not think it becoming, especially after the lofty ground our Executive has taken, that we should satisfy ourselves with acting a secondary part in rather a small private enterprise. * * I repeat, sir, and I desire to do it emphatically, if we are to engage in this enterprise let us do it on our own account, in a manner befitting us as a nation; let us send out a national vessel under instructions from our government and upon our national responsibility. * * If we have no vessels that are fit for the service, let us purchase such as are, or have nothing to do with this expedition. Do

not let us connect ourselves with it just so far as to make us responsible for it without any control over it."

Mr. E. D. Baker, of Illinois, supported the resolution in some eloquent remarks, in the course of which he said: "It is this generous love of glory that I admire; it was this which prompted the 'World-seeking Genoese' to the noblest enterprise of any age and kept him firm amid the terrified mariners and on an unknown and stormy sea. It is this which kindles high hearts to all great enterprises; and, sir, when this love of glory seeks its accomplishment in noble discovery, I not only admire but honor it, and I am honored in being allowed to aid it. But, sir, the whole American people have an interest in these expeditions. It is no longer true of England that she is 'mistress of the ocean;' we too hold our 'march upon the mountain wave,' our keels vex every sea; and whatever opens new channels of commerce, adds to our wealth and dominion. And yet I am disposed to place the support of this measure upon higher ground. It has been said that literature belongs to no age and no country. It may be repeated of discovery and invention, as the benefit is for all ages and all countries, for the world and for the whole family of man."

Several attempts to adjourn the House without action were voted down, and after considerable fillibustering the main question was ordered and the joint resolution passed by a vote of 94 yeas to 45 nays.

The following is the text of the resolution as passed:

Resolved, That the President be and he is hereby authorized and directed to receive from Henry Grinnell, of the city of New York, the two vessels prepared by him for an expedition in search of Sir John Franklin and his companions; and to detail from the Navy such commissioned and warrant officers, and so many seamen as may be necessary for said expedition and who may be willing to engage therein. The said officers and men shall be furnished with suitable rations at the discretion of the President for a period not exceeding three years, and shall have the use of such necessary instruments as are now on hand and can be spared from the Navy, to be accounted for or returned by the officers who shall receive the same.

SEC. 2. Be it further *Resolved*, That the said vessels, officers and men shall be in all respects under the laws and regulations of the Navy of the United States until their return, when the said vessels shall be delivered to the said Henry Grinnell; *Provided*, That the United States shall not be liable to any claim for compensation in case of loss, damage or deterioration of the said vessels or either of them, from any cause or in any manner whatever, nor be liable to any demand for the use or risk of said vessels or either of them.

After the vote was announced, Mr. McLane, of Maryland, stated that he should favor the passage of a joint resolution refunding to Mr. Grinnell all the expenses he had incurred in fitting out the expedition.

This should have settled the matter in the House and did so far as action on the measure itself was concerned, but on two subsequent days—April 29 and May

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1—warm discussions on points of order connected with its passage, form part of the record, showing the bitterness with which its opponents fought.

The joint resolution as it passed the House was reported in the Senate April 29, and a motion to refer it to the Committee on Naval Affairs, made by Mr. Bright, was withdrawn upon the statement of Mr. Miller, of New Jersey, that the subject had already been discussed in the Committee, and it had at its last meeting determined to report a similar resolution to the one now before them.

May 1st—On motion of Mr. Miller the Senate postponed all prior orders and took up the resolution. It was advocated by Messrs. Miller, Clay, Seward, Pearce, of Md., Yulee, of Fla., Dayton, of N. J., Butler, of S. C., and Houston, of Tex., and was opposed by King, of Ala., Foote, of Miss., and Davis, of Miss., and after a lengthy discussion passed by a vote of 28 yeas to 16 nays.

The following extracts show the line of argument followed by the speakers on both sides:

Mr. Clay said: "Although I accord in the expression of opinion urged against the union of a public and individual enterprise generally, yet in a case of this kind I should hope that would not be permitted to prevent the passage of this resolution. * * * It may turn out, too, that in carrying out this enterprise, other discoveries may be made which will benefit our country and the world."

Mr. King said: "If I could think it proper to mingle up the affairs of an individual with those of the government of the United States, I would unhesitatingly vote for this proposition. But I hold that the government of the United States ought not in any case to connect itself in this way with a private individual. I hold that you should not place the officers and seamen of the United States under the control of any private individual whatever. * * Is it not better that the United States should take the subject into its own hands and make a liberal appropriation? I would vote for the largest appropriation necessary to purchase suitable ships, and if this suggestion is approved I will move the recommitment of the resolution to the Committee that they may report a bill to carry out the suggestion—that the government of the United States may carry out the expedition at its own expense and that we may not mix ourselves as a government with the enterprise of any individual."

Mr. Miller said: "I prefer that the government should have the entire control of the enterprise, but this cannot now be done within the time required to produce the good results which are to be hoped from this expedition. * * * * If we refer the resolution back to the committee and they report a bill authorizing the government to build ships to carry on the expedition on its own account, it would be attended with very great delay, and in my opinion defeat the object we have in view."

Mr. Foote said: "It is proposed that inasmuch as the government of the

United States has become suddenly be-dwarfed in its faculties, and has lost all its efficiency for the execution of a noble undertaking that has once found favor in its eyes; and inasmuch as this government, whose naval power is now the object of admiration to all nations, is not able to supply ships suited to an interesting purpose of exploration; or, perchance, since pecuniary means for the execution of this grand scheme are not possessed by the government, a man of wealth is to be allowed to step in and monopolize the whole glory of the object; that he whose arms are stronger than the arms of the nation, he whose purse is more fully replenished with gold than that of the richest nation in the world, shall be allowed to fit out this expedition according to his own individual judgment, while this government shall become, not a dormant partner, but shall become an openly declared but yet a decidedly *subordinate* partner in the concern. * * * * The government cannot engage in this enterprise without a serious loss of dignity at least. * * * If anything is to be done let it be done with a due regard to the honor of the nation and with a full view of the responsibility connected with our acts."

Mr. Seward said: "When great objects and great enterprises which are feasible are hindered or defeated, it is not so much by want of agreement concerning the measures themselves as by diversity of opinion concerning the mode of carrying them into execution. * * * I accordingly agree with those honorable Senators who would have preferred the government should have moved for the attainment of this object as a government, and made it exclusively the act of the nation, * * * but the government has not moved and the time has arrived when a movement must be made, and I shall vote for the resolution."

The opposition dwelt strongly upon the failure of the administration to carry out its implied promise of aid in the Lady Franklin correspondence, and most of the debate turned upon this point, the Democrats attacking and the Whigs defending the administration in the usual partisan manner, but most of the Senators rose above party in view of the peculiar nature of the expedition. Of this class was Mr. Yulee, who said:

"I shall vote for the resolution because it may result in important advantages to our commercial interests. * * * We have many more officers in the Navy than the necessities of the service can require. The service will be actually benefited by the employment of some of the officers in this expedition—perilous and dangerous I agree, but yet honorable to them and advantageous to the government. These officers are receiving pay whether in service or not. The *personnel* of the Navy, so far as the seamen are concerned, is limited by act of Congress to 7,500 men, and no more can be employed. The whole amount of this matter then will be that thirty of these men will be employed in this instead of some other service and receive only the remuneration which they would receive elsewhere in other situations. But more than all this. It is not at all unlikely that this expedition may reach beyond the icy barrier, into

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open seas, which may open to our varied interests a very large field from which increased benefits may be derived."

Mr. Butler said: "It will indeed be a great triumph to American enterprise if we could make the discovery about which so much has been said, a very great triumph. I know that national reputation is national property of the highest value; and if we can acquire reputation by making the discovery, I shall rejoice at it. The chairman of the Committee on Naval Affairs has told us that these officers are willing to embark in this hazardous enterprise, and that the men will also embark voluntarily; and he also tells us that he is taking men who are doing nothing and putting them into employment, such as may redound to the honor of the country."

Mr. Houston said: "I shall vote for the resolution because it will afford American officers and American seamen an opportunity of distinguishing themselves and acquiring a reputation and character for our naval force."

The joint resolution was approved by the President May 2, and so promptly was Mr. Grinnell seconded by the Government now that proper authority had been obtained, that the expedition sailed from New York on the twenty-second of the same month.

It consisted of two small sail vessels—the "Advance," 144 tons, and the "Rescue," 91 tons—with the following officers and crew, detailed from the U. S. Navy:

ADVANCE.—Officers: Lieutenant Commanding, Edwin J. De Haven, Commanding the Expedition; Passed Midshipman, Wm. H. Murdaugh, Acting Master and First Officer; Midshipman, William I. Lovell, Second Officer; Elisha Kent Kane, M. D., Passed Assistant Surgeon. Crew: Wm. Morton, Henry De Roque, John Blinn, Gibson Caruthers, Thomas Dunning, William West, Charles Berry, Louis Costa, William Holmes, Edward Wilson, William Benson, Edward C. Delano, James Smith.

RESCUE.—Officers: Acting Master, Samuel P. Griffin, Commanding the "Rescue"; Passed Midshipman, Robert P. Carter, Acting Master and First Officer; Boatswain, Henry Brooks, Second Officer; Benjamin Vreeland, M. D., Assistant Surgeon. Crew: William J. Kurner, Auguste Canot, John Williams, Robert Bruce, William Lincoln, Smith Benjamin, Rufus C. Baggs, David Davis, James Johnson, James Stewart, Alexander Daly, H. J. White.—Total, 33.

The expedition reached New York on its return, Sept. 30, 1851, having been absent a little more than sixteen months, having aided in the discovery of authentic traces of Sir John Franklin's party and of the land named after the projector of the expedition, "Grinnell Land."

The detailed narrative of the expedition, by Dr. Kane, and published by Harper Bros. in 1853, is one of more than common interest, and should be read by those who wish to obtain a clear idea of Arctic life and enterprise.

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ZOÖLOGY.

SILK CULTURE—A NEW SOURCE OF WEALTH TO THE UNITED STATES.

BY PROF. C. V. RILEY, WASHINGTON, D. C.

(*Abstract.*)

On account of the length of the paper, and in order to economize the time of the Association, Prof. Riley presented the argument without the details.

The paper is largely statistical, giving tables of exports and imports of raw and manufactured silks for the last half century, and bringing out clearly the steady growth of the silk manufacturing industry of the country, especially during the last decade, under the protective import duties on manufactured goods. The author starts out with the axiom that the establishment of any such wealth-producing industry as that of silk culture and manufacture as an integral part of our productive resources, is well deserving the attention of the people and of legislators. Just as the American Philosophical Society, little more than a century since, gave great impetus to, and fairly established the silk industry in Pennsylvania—established it so firmly that, had it not been for the Revolution, it would undoubtedly have continued to grow from that day on, so there is no reason why the American Association for the Advancement of Science should not be partly instrumental in re-establishing that industry on a broader and more permanent basis. The author rapidly sketches the history of silk culture the world over, and especially in the United States, showing how from 1740 to 1790 hundreds of silk-growers in the Southern, Middle and New England States, and especially about Mansfield, Conn., were successful, and how the industry has flourished under the stimulus, at times, of State aid. He traces the causes of failure in the past, and the point is strongly brought out that they were all transient, not permanent ones.

Speaking of silk culture, Peter Delabogie, in an address published in the very first volume of the Agricultural Transactions of the State of New York, (1801,) said:

"GENTLEMEN: You have in your hands all the means requisite for success and for enriching yourselves with the culture of silk. It remains with you to compare and judge our many attempts in it, and discover wherein they have been defective."

Prof. Riley points out wherein the first attempts have been defective, and have consequently failed. Every writer who has given the subject thorough consideration has been of the opinion that there are no absolute obstacles in the way of silk culture in this country.

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Mr. A. T. Lillie, in an admirable review of the silk industry in the United States, from 1766 to 1874, drawn up largely from personal reminiscences, says: "The production of raw silk in this country, which, in 1828, amounted in Mansfield alone, to three thousand two hundred pounds, and which ceased entirely in 1844, has since been revived in California, meeting there with modified success. There is no good reason why it should not be again extended throughout the United States. Since the introduction of the mulberry seed by Dr. Aspinwall, in 1766, the history of this culture has been pregnant with encouragement, and only a fortuitous conjunction of misfortunes checked it."

Speaking of the attempts of M. Provost in California, which is conceded to be, by climate, eminently adapted to the growth of the mulberry, and the rearing of the worms, Mr. Riley attributes much of the want of permanent success which followed the efforts made at San Bernardino to the extravagant statements and excessive enthusiasm, verging on fanaticism, which characterized all of M. Provost's writings and utterances. Had he been as prone to report failure as he was to magnify success, there would not have been a re-active depression, which was as unnatural as was the over-enthusiasm. M. Provost's little work, "The California Silk Grower's Manual," was better calculated to induce another multicaulis fever than to healthily stimulate silk industry. Its exaggerated pictures and immoderate statements annul what little value it did possess, and earn for its author the name of *blagueur*, which has been applied to him in France.

Speaking of the effort of M. E. V. Boissiere, at Silkville, in Franklin county, Kansas, Mr. Riley expresses the highest appreciation of the intelligent attempts of the founder of that silk colony. The industry has, however, lagged, for the simple reason that it has been found less profitable than stock-raising and other general farming operations. M. Crozier, who has had charge of the silk establishment lately, has also found that the sale of eggs and the sale of mulberry cuttings are more profitable than the reeling and manufacture of the silk, and there is great danger that, from self-interest, greater harm than good will eventually come from this Kansas attempt. M. Crozier is now making every effort to encourage the purchase of his mulberry trees, an attempt which must be as injurious as it is premature, because it is stimulating an unnatural demand for the trees, in the face of the fact—shown by his own experience—that there is no profit yet to be derived from the production of the cocoons.

Very much the same may be said of other efforts that have been highly applauded without sufficient cause, and of plans prematurely and glowingly reported. As an instance, Mr. Riley mentions the accounts that have recently been published of the success attending the efforts of Mr. S. Lowery, of Huntsville, Alabama, who is reported to have successfully raised and spun and utilized the silk, and who is said to contemplate establishing an industrial academy for silk culture. Investigation shows that the few cocoons (reared by one of Mr. Lowery's daughters) are of an inferior Syrian race, having no commercial value; that the worms were fed on lettuce, and that the silk which was carded and spun is simply interesting as a curiosity, but not as an article of commerce.

The most valuable portion of the paper is that which points out the present prospects of silk culture and the way in which it may be established. In his report for 1877 to the President of the United States, the Commissioner of Agriculture gives tabular estimates of the value of many different products which we now import from foreign countries, and which may be produced at home, and this shows that over $236,000,000, not including additional expense for freight and commissions, are paid annually for imports, all of which could and should be saved to the people. The item of silk alone foots up to over $23,000,000.

In his commendable efforts to increase the productive capacity of the country by the encouragement of neglected industries, silk culture has not been overlooked by Commissioner Le Duc, and Prof. Riley expresses his gratification that his connection with the Department will enable him, with the Commissioner's co-operation, to do something for the permanent establishment of this industry, which he has followed with interest since the publication of his article on silk culture, in his Fourth Missouri Entomological Report (1871). Mr. Riley shows that the time is rife for systematic, intelligent effort in the line of silk-raising. The old argument that we can not compete with the cheap labor of Europe and Asia, no longer has the force it had in years gone by. With a large tramp element that is proving disastrous and annoying; with a large portion of the population in the more crowded Eastern cities out of employment; with any number of females and young people most anxious to earn something for a livelihood; with the people of the South looking for new avenues of industry—the cheap labor argument can no longer be successfully made against silk culture. The cheap labor of foreign countries is just as available for cotton and other industries as for silk, and the same objection has at one time or other been urged against most of our more important industries. Our people are neither lacking in industry, ingenuity or energy, and will more than make up in these respects for the more ignorant, though cheaper labor, of other countries.

But it is not a question, Prof. Riley argues, of whether we can compete with foreigners, either in living as cheaply or producing as cheaply. It is a question of adding to our own productive resources. There are hundreds of thousands of families in the United States to-day who would be most willing to add a few dollars to their annual income by giving light and easy employment for a few months each year to the more aged, to the young, and especially to the ladies of the family, who often have no other means of profitably employing their time.

This holds especially true of the people of the Southern States, most of which are pre-eminently adapted to silk culture. The girls of the farm, who devote a little time each year to the raising of cocoons, may not earn as much as their brothers in the field, but they may earn something, and that something represents an increase of income, because it provides labor to those members of society who at present too often have none that is remunerative. Further, the raising of a few pounds of cocoons each year does not, and need not, materially interfere with the household and other duties that now engage their time, and it is by each household raising a few pounds of cocoons that silk culture must in the end be

carried on in this, as it has always been in other countries. Large rearing establishments seldom pay.

Experiments that have been made in the past, and a series the author himself had been carrying on for the last ten years, abundantly establish the fact that the climate of the larger portion of the United States is admirably adapted to this culture. This is not only proved by the healthfulness of the worms, when intelligently fed and cared for, but by the fact that we have a larger number of native silk producing insects than any country of the same extent, and by the further fact as proved by experience, that silk raised here is of a superior quality.

Now, experience shows that silk culture in the past has failed largely because of the want of a market, and Prof. Riley maintains that the first thing requisite is not the dissemination of mulberry trees or of silk-worm eggs, but the establishment of filatures or reeling factories. All attempts to stimulate the industry unduly are hurtful. It must grow, as all other industries have, and when once firmly established, on however small a scale, there can be no doubt that it will grow as steadily as all other industries have grown when once established in this country. The difficulties met with in the past have not been greater than they were in France and other countries, which persevered until failure after failure was overcome.

The great question is, how shall we encourage the production of silk and the reeling thereof? There is at present no market in this country for cocoons, except for those which are pierced, and which, being carded and spun, bring a very low price. Nor will there be a market for them until some one shall engage in the business of reeling. Yet it would not be prudent for any business man to engage in reeling until he had some assurance of getting a supply of cocoons. Now, how to break out of this close circuit is the problem. Just as the manufacturing industry has been stimulated by the encouragement given it by the National Congress, silk culture should be in the same manner stimulated.

There ought to be no real antagonism between the manufacturer and the producer, and our manufacturers would certainly very gladly purchase home-raised silk in preference to that raised abroad, more particularly as they find it very difficult to prevent fraud and deception on the part of their Asiatic dealers. Yet, a duty on raw silk that would encourage or stimulate the growth thereof in this country would naturally meet with the opposition of manufacturers, and here lies the whole difficulty. Yet it is not an insuperable one. Protection of a productive industry in its infancy adds to the general wealth; protection of the manufacturing industry, while desirable as a fostering agency, becomes injurious to the masses by benefiting the few and encouraging monopoly, unless wisely gauged and enacted There is always great danger of unwise legislation in the interest of manufactures, brought about by influences which associated capital can always wield.

With improved machinery, with superior labor, and the greater profits that naturally flow from them, our silk manufacturers have prospered, and their late rapid increase during a period of general depression in other branches of indus-

try is the best evidence of the fact. They are in a position to bear a small import duty on raw silk. If Congress will impose such a duty, and in addition give the Department of Agriculture the means to erect proper reeling machinery, and to introduce properly trained reelers, so as to form a nucleus for the reeling branch of the industry, this is all, in Prof. Riley's opinion, just now needed from the National Legislature. The dissemination of proper information and of silkworm eggs may be left to the Department.

Our attempt should be to encourage the culture of silk, and the reeling of silk, without, if possible, affecting or injuring the throwing and twisting business, which is perhaps not firmly enough established to be able to continue without some protection. To cripple or destroy or impair this industry would, of course, remove the market of the silk-grower, and there is no absolute necessity for any present change in the present tariff on manufactured silks.

Prof. Riley believes further that each State should encourage not only the culture of silk, but offer a bounty of, say 50 cents or $1 per pound for the cocoons, and $1 or $1 50 per pound for reeled silks.

The part of the paper that is, perhaps, the most interesting from a scientific point is that relating to the production of silk from the osage orange.

Mr. Riley has been very much interested in this part of the inquiry for many years, and has raised consecutively for the last eight years a race or breed of worms—a cross between one of the best Japanese and one of the best French races—with great success. He found that the worms, became if anything, more and more healthful and hardy upon this plant. Silk from osage orange reared worms, when fed intelligently, was in both quality and quantity equal to that from mulberry fed worms. This important fact is not admitted by those who have mulberry trees for sale, but Prof. Riley has good reason, based on experience and experiment, for the statement. This he considers a very strong point in favor of the United States, as, in case the mulberry trees should at times be cut off, as they were at the close of the *multicaulis* fever of 1839 and 1840, by mildew and disease, American silk-growers, could, nevertheless, continue their calling by employing the osage orange, which, throughout that portion of the country best adapted to silk culture, thrives and is never subject to any such injury. Moreover, in order to commence the raising of silk the average farmer will not have to wait for the growth of the mulberry trees, or lay out any capital therefor.

There is an increasing interest manifested throughout the country on this subject. Inquiries are constantly being received at the Department of Agriculture as to how to attend to the worms, and on all possible subjects connected with silk culture, and it is the intention of the Department to send out or to publish in due time a comprehensive manual of instructions, and which, by widely disseminating the desired information on the subject, will help to establish the industry.

THE PHILOSOPHY OF THE MOVEMENTS OF THE ROCKY MOUNTAIN LOCUST.

BY PROF. C. V. RILEY, WASHINGTON, D. C.

(*Abstract.*)

No paper so far read before the Association contained in so short a space the results of such extensive observations and investigations. In reality, it gives a *resume* of some of the more interesting scientific results of the investigations of the United States Entomological Commission. The author shows that prior to the year 1876, very little that was accurate and reliable was known of the destructive locust that at times proved so disastrous to the agriculture of the trans-Mississippi country, while still less was known of its movements. Had any one been asked even eighteen months ago, whence come the ravenous hordes that sweep over the fertile country between the Rocky Mountains and the Mississippi, or whither they go, he could have given but a hypothetical answer. Mr. Riley shows that the situation is now materially altered, and that we are in possession of much absolute knowledge, both as to the habits, natural history and movements of this destructive insect.

The paper treats mainly of the principles which underlie these movements. The author premises that any rule or law we may formulate in biological science will admit of exceptions, and can never possess the same fixed and absolute character that belongs to rules in the exact sciences.

In order to treat intelligently of the locust problem in the West, the United States Entomological Commission found it necessary to divide the territory affected by the destructive species (*Caloptenus spretus*) into three principal regions.

First, the Permanent Region, or native breeding grounds of the species, which comprises all the vast region of the Northwest, between the latitude 37° and 52°, and reaching from the mountains to about the 103d meridian. This forms altogether the most extensive breeding ground, and comprises an area north of the boundary line nearly equal in extent to that south of the same. West of the main range it is represented by more restricted areas. In all this vast region the climatic conditions and flora characteristics are similar. It is an extensive plateau, from 2,000 to 6,000 feet above the sea level. The summers are unusually dry and intense, the winters long and severe. The atmosphere is attenuated and the vegetation generally sparse; the ordinary plains covered with short but nutritious grasses, now giving way in moister sections and along water courses to a rank prairie growth; now to almost complete desert, where little but the sage bush and a few cacti will grow. In the main it is what naturalists call a sub-boreal region. The extent of this territory is not less than 300,000 square miles. But the insect does not breed uniformly over the whole. It propagates principally on the most moist plateaus; in the river valleys; in the sub-Alpine mountain parks, protected slopes, canyons and so on, wherever, in short, vegetation

is favored; the valleys of the South Saskatchewan, the Yellowstone and North Platte being the most extensive breeding areas.

The prevailing winds in this region, east of the mountains, are conspicuously from the northwest during the season when the insect is attaining maturity and full wing-power, and it is from this region that emanate the swarms that sweep the Lower Mississippi country. West of the main range and in portions of Montana and Wyoming, especially west of the Belt Range, there is no such uniformity in the course of flight, and local influences more materially affect it. The species is always to be found more or less numerously in this Permanent region.

The Sub-permanent region is a comparatively narrow area, bordering the Permanent region on the east, where the insect is perpetuated for several years, but from which in the end it disappears.

The Temporary region embraces the large extent of fertile country lying all around the other two regions. It is the country which the insect visits and devastates at irregular intervals, in which it can not permanently thrive and which it almost always vacates within a year. In this Temporary region the species becomes diseased and can not hold its own, and in the Mississippi Valley there is always a return migration of such insects as hatch within it, and do not perish from disease and enemies before getting wings, the direction being conspicuously toward the Permanent region. This return migration, first set forth by Prof. Riley in 1874, commences in April in Texas, and continues from more northern points till about the middle of July, and, as in the case of the invading movements from the Permanent region, which occur from the middle of July on through the autumn, it is aided by the prevailing winds which, during April, May and June, are pretty constantly toward the northwest. In speaking of the causes of migration, Prof. Riley shows that there is some truth in many of the different theories advanced in explanation of these migratory movements, and that we must not look to one, but to several causes that may, either singly or combinedly, produce the result. The predisposing cause he considers to be excessive multiplication, for the others are mostly secondary, or but consequences of this one. Among these he mentions: (1.) Hunger. (2.) The procreative instinct. (3.) Increase of and annoyance from natural enemies. (4.) Instinctive impulse. The paper shows clearly that all these minor causes act more or less effectively, according to circumstances.

Regarding the fourth, or instinctive impulse, which most naturalists are not inclined to allow in an insect, the author remarks, that, as already stated, the return movements are aided by the wind. That they are not, however, solely dependent on the wind, but largely instinctive, is proved by numerous observations, showing that the insects, in migrating, pursue a definite course, and move only when the wind favors that course. Numerous instances confirmative of this statement are recorded in the report of the Commission that has lately been published. The insects, in migrating, only move when the wind favors their course. This is particularly true of the return migration. Again, the fact that there is a well marked limit line to the eastward spread of the insect, coupled with the return mi-

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gration, is not to the same extent susceptible of any other explanation. The preservation of the species—an instinctive desire to go to a more congenial soil and climate—is evidently the principal exciting cause to this return migration. Hunger can have no part in it, since the insects pass over great stretches of luxuriant vegetation, both wild and cultivated. In the Professor's words: "The more I study these movements, the more I feel that for their proper explanation we must allow a certain amount of instinctive guidance, akin to that possessed by migratory birds." In treating of the eastern limit of the spread of this pest, Prof. Riley brings out some very interesting facts. Nothing seems more natural at first blush than that an insect which is able to travel, in the course of a single summer, from the Northwest Territory to Galveston, or points further south, and from the Rocky Mountains to Central Iowa, should also be capable of extending to any part of the country. Yet the history of all past invasions shows that there is a well-defined limit beyond which the species has never reached to do harm, and beyond which there is every valid reason to believe that it never will, so long as the present configuration and climatic conditions of the continent obtain. Particularizing this eastern limit, it is shown to extend from a point starting from the southern end of Lake Winnipeg to some twenty miles east of St. Paul; thence south to Storey county, Iowa; thence westward, receding to Northwest Missouri; then bulging again to Pettis county, Missouri; and thence pretty direct through the extreme northwest corner of Arkansas to Galveston, Texas. There is here along this line a well-defined limit to the eastward spread of the destructive insect, more effectual than the highest mountain ranges in other parts of the country. This fact is established.

The explanation of the fact is another matter. Limit of the insect's power of flight was Walsh's explanation, but it is unsatisfactory, since *a priori*, there can be no such definite limit to the flight of an insect that can be carried by wind fourteen miles out at sea, and that can halt and rest at will.

The reasons are, according to Prof. Riley, physical, and principally atmospheric. In the prevailing direction of the winds during the seasons of flight, in the increasing humidity, consectaneous with decreasing altitude, and especially in the shade and moisture that accompany forest growth, he finds tangible reasons, and it is an interesting fact, first brought out by the Professor, that the separation of the timber from the plains and prairie regions—or more correctly speaking, the line that separates that vast region between the Mississippi and the mountains, in which the timber averages not more than six or seven out of every 100 acres, and that in which it averages twenty-five or thirty out of 100, forms in the main this limit line, both in the United States and in the Saskatchewan country.

Three important generalizations or rules for guidance are thus obtained for the solution of this locust problem. There is the invasion from the permanent to the temporary region, the return immigration from the latter to the former, and the eastern limit of extension. There is yet a fourth rule which also has some bearing on the movements of this locust. It is that in the temporary region whenever the young insects abound to such an extent as to keep the earth bare of veg-

etation in summer (implying thick and extensive egg-laying the previous year) there will be no eggs laid in such devastated region the same year. This means that a year of utter locust devastation, like that of 1875 in many parts of the west will be followed by one of perfect immunity from the pests. The explanation of this last rule is found in many interesting facts recorded in the Report of the Commission.

Speaking of the work of said commission, Prof. Riley remarked that during the past year it has been able to define or map the geographical range of the species, and to trace the source of the more injurious swarms. In short, what was mystery before is mystery no longer. "Aside from the large number of new facts of scientific interest as to the insect's habits, development, anatomy and enemies, we have learned how effectually to cope with the unfledged young, while we point the way to practically prevent the disastrous incursions from the permanent region." With these economic details the author did not wish to detain the Association, as they are given in the Report of the Commission.

When we recall the extent of the territory involved, embracing fully one-half of the superficial area of the United States, and remember how little that is definite is yet known of the sources, range and movements of the *Œdipoda migratoria*, which has since Biblical times so sorely devastated large portions of Europe and Asia, we may well feel some pride in our Government investigation. The importance of the work will best appear by the fact that the most careful estimates place the loss to the Western States and Territories since 1873 at $200,000,000, to say nothing of indirect loss and suffering on the part of frontier population, illy prepared to bear it. By virtue of the individual observations of the Commissioners, and of the special assistance and correspondence employed over the country affected, they were able confidently to state in advance to the farmers of the West that there would be no serious locust injury of a general character the present year, nor perhaps for some years to come; and they point to an emigration the past spring to the locust devastated regions of Texas, Kansas, Iowa, Nebraska and Minnesota, unprecedented in the history of our country, as part of the result of this encouraging announcement.

Speaking of the future work of the Commission, Prof. Riley said there is much yet to be done in more fully studying portions of the permanent regions yet unexplored, in giving practical application to the information obtained, and in securing the proper State co-operation and legislation to carry out the recommendations and suggestions already made. It is to this task that the Commissioners are now devoting themselves.

Before concluding, the author paid a well deserved compliment to Dr. F. V. Hayden, without whose knowledge of the needs of the West, his forethought and energy, the investigation, according to Prof. Riley, would scarcely have been ordered by Congress.

POETICAL VS. PRACTICAL ZOÖLOGY.

BY GEORGE L. AUSTIN.

The poetry of modern times enshrines many popular superstitions respecting members of the animal kingdom. It would not be desirable to remove them from its pages, for they supply illustrations of value and interest as to the intellectual condition of by-gone society, and are chapters essential to a complete history of knowledge. It is curious, however, to trace, when able to do so, such wild imaginations to their origin; and we purpose, in the present writing, to account for certain of these singular fallacies, fully believing that nearly all are referable to simply coincident circumstances.

We think that it has doubtless happened in many a sick-chamber, and immediately, too, before the dissolution of the patient, that the noise of the puny insect, vulgarly called the death-watch, has been heard. It was a very easy thing for the fancy of premonition to arise with this, which has so often disturbed the habitations of rural tranquillity, and from which they are not yet wholly free.

"The solemn death-watch clicked the hour she died;"

but it was not the *voice* of the insect; the noise was owing to its beating on some hard substance with the shield or fore-part of the head. It is intended merely to summon a companion, and answers exactly to the call-note of a bird.

Everybody knows of the kingfisher, or, as the bird was called in the days of Aristotle, the halcyon. Dryden says:

"Amid our arms as quiet you shall be
As halcyons brooding on a winter sea."

And Browne:

"Blow, but gently blow, faire winde,
From the forsaken shore,
And be as to the halcyon kinde,
Till we are ferried o'er."

And the author of "The Storm" writes

"All Nature seemed
Fond of tranquillity; the glassy sea
Scarce rippled; the halcyon slept upon the wave,
The winds were all at rest."

The idea that the halcyon possessed the marvelous faculty of pacifying the wind and wave by its presence seems to have sprung solely from the well-known habits of the bird. It fishes only by sight, and takes only small prey. Hence all those circumstances require to be avoided which would interfere with distinct vision, in order to the success of its operations. It, therefore, frequents particular spots, and is out in certain states of the weather; brawling and turbulent streams are avoided; and the days when the atmosphere is the most transparent and still, the waters most calm and clear, are precisely those which the kingfisher loves, and in which he is most commonly seen.

Sir Walter Scott thus misrepresents the natural history of the field-fare, be-

longing to the thrush tribe, in the following picture, referring to Scottish ground:

"Within a dreary glen,
Where scattered lay the bones of men
In some forgotten battle slain,
And bleached by drifting snow and rain;
The knot-grass fettered there the hand
Which once could burst an iron band;
Beneath the broad and ample bone,
That bucklered heart to fear unknown,
A feeble and a timorous guest—
The field-fare—*framed her lowly nest.*"

Sir Walter was a keen sportsman; but he seems not to have known that the field-fare neither breeds in the British Isles, nor even builds on the ground in its native quarters. It is a bird of Norway, where it frames its nest in the firs and larches at the height of from ten to forty feet above ground. In the winter season it visits England and Scotland in great numbers.

Lord Byron likewise errs when he says:

"Even as an eagle overlooks his prey,
And, for a moment poised in middle air,
Suspends the motion of his mighty wings,
Then swoops with his unerring *beak.*"

The king of birds invariably seizes its prey with the talons, carries it off to the nest, or some other place of security, and there at leisure uses the beak for tearing it in pieces.

A poet may be pardoned for following the errors of the naturalist of his time but for a poet of the present day to adopt an old mistake of natural history, and to give to it circulation as an undoubted fact, it is altogether different and wholly unjustifiable. We should not blame the old dramatist for saying:

"I will play the swan,
And die in music."
"He makes a swan-like end,
Fading in music."

But surely Doane is culpable in the following iteration of a completely unfounded fancy:

"'What is that, mother?
'The swan, my love.
He is floating down, from his native grove,
No loved one now, no nestling nigh;
He is floating down by himself to die;
Death darkens his eyes, and unplumes his wings,
Yet the sweetest song is the last he sings."

Many if not most animals retire from the companionship of their kind to die in solitude. The swan may do this; but certainly there is no musical accompaniment in the case, for the bird is utterly incapable of it. The domesticated swan has no note but a hiss, and the tone of the wild or whistling swan is equally harsh and dissonant.

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In the "Midsummer-Night's Dream," the fairies are said to light their tapers

"At the fiery glow-worm's *eyes*."

But it so happens that the luminosity proceeds, not from the eyes, but from the tail of the insect. Says Thomson:

"Along the crooked lane, on every hedge,
The glow-worm lights *his* gem."

But it happens, further, that the male glow-worm is very rarely seen, is much smaller than the female, and gives out no light. Thomson thus writes of another insect:

"Light fly his slumbers, if perchance *a flight*
Of *angry gadflies* fasten on the herd."

To make known the truth is to spoil the poetic beauty of this whole passage. But, though a small matter, to be sure, the error is sufficiently important to bear correction. The gadfly is not a social insect, and it pursues its way singly, not in a flight or swarm. Furthermore, it is not anger, but instinct, that induces him to "fasten on the herd."

It used to be supposed that gossamer, the web of the field-spider, was formed of dew evaporated by the sun's heat into threads; and it is to this that Quarles thus refers:

"And now autumnal dews were seen
To cobweb every green."

Milton goes astray in the following:

"Swarming next,
The *female* bee, that feeds her husband drone
Deliciously, and builds her waxen cells
With honey stored."

The working-bees, which form the mass of the population, are neuters; the drones are males; and of the queens, or females, there is usually but one in a hive.

The natives of New Guinea, and of the adjoining Papuan archipelago, in preparing and drying the skins of the gorgeous birds-of-paradise, are in the habit of removing the feet. In this state they are sold to the Malays, conveyed to India, and thence to European countries. This custom led Linnæus, erroneously to name one of the best known species "footless" (*Paradisea apoda*); and also misguided Southey in the following lines from his "Curse of Kehama:"

"The *footless* fowl of heaven, that never
Rest upon the earth, but on the wing forever,
Hovering o'er flowers, their fragrant food inhale,
Drink the descending dew upon its way,
And sleep aloft while floating on the gale."

A beautiful passage in the Book of Proverbs has been made the foundation for many wrong views of the habits of the ant, both in poetry and prose: "Go to the ant, thou sluggard; consider her ways, and be wise; which, having no guide, overseer, or ruler, provideth her meat in the summer, and gathereth her food in the harvest."

In these words, Solomon probably alluded to a species with which we are not familiar; but, waiving any dispute on this score, it will be observed that he makes no mention of any particular kind of food, and, if the idea of storing provision is suggested, imparts no hint of its being intended for winter use. A recent Oriental traveler speaks of a species of ant in India which hoards up in its cell the seeds of grass, and takes the precaution of bringing them to the surface to dry, when wetted by the heavy seasonal rains of the country.

Now, nothing is more common among men than to furnish their larders with more than is requisite for immediate wants, when abundance can be commanded, simply to save trouble. The general sentiment of the words of Solomon, then, relative to the ant, is that, in the appropriate natural seasons of summer and harvest, when food of all kinds is most readily obtained, the insect is industrious in profiting by favorable opportunities, having both present and prospective wants in view. But let us glance at the poetical representations—or, rather, misrepresentations—of the ant.

Dr. Watts yields his modicum of blunders:

> "They don't wear their time out in sleeping or play,
> But gather up *corn* in a sunshiny day,
> And for *winter* they lay up their stores;
> They manage their work in such regular forms,
> One would think they *foresaw* all the *frosts* and the storms,
> And so brought their food within-doors."

The poets, we imagine, would not thank us for meddling with their philosophy except *causa veritatis*. In the first place, the ant does not subsist on grain; but, being of a carnivorous habit, would prefer the carcass of a worm to all the wheat and corn in the world. In the second place, inasmuch as the greater part of the winter season is passed in a torpid state, the ant has no occasion to lay up a future store. The whole truth of the matter is this: Ants carry about their young in the state of *pupæ*, or as things wrapped up and swaddled, which both in size and shape have certainly some resemblance to grains of wheat. They are also seen occasionally gnawing at the end of one of these bandaged babies, for the purpose of liberating it from confinement. These operations, cursorily judged of according to the mere appearance, gave rise to the corn-bearing imagination for winter use, which Solomon's reference to summer and harvest seemed to sanction; and likewise to the idea of biting the grain to destroy the power of germination.

While writing of the ant, we are led to say a word or two with regard to the mole, which Aristotle, and a host of other writers since his day, pronounced blind:

> "Pray you, tread softly, that the *blind* mole may not
> Hear a footfall; we now are near his cell,"

are the words of Shakespeare. Dryden says:

> "Like a mole, busy and *blind*,
> Works all his folly up, and casts it onward
> To the world's open ear."

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And Pope, also:

"What modes of sight betwixt the wide extreme!
The mole's dim curtain and the lynx's beam."

We will admit that there is a species of mole, indigenous to the south of Europe, which is totally blind; but the English species, to which Shakespeare, Dryden, and Pope, thus refer, has all the organs of vision perfect, and is not even dim-sighted. The eyes are very small, however. The sense of hearing is remarkably fine, and the sense of smelling is most exquisite.

And now comes the poor, harmless, and maligned toad, which has suffered great injustice at the hands of mankind. It was once believed that the head of an aged toad contained a stone or pearl possessing great virtues, and we all remember Shakespeare's lines:

"Sweet are the uses of adversity;
Which, like the toad, ugly and venomous,
Wears yet a precious *jewel* in its head."

Unfortunately, there is no foundation in fact for this poetical simile.

Pennant, the naturalist, says of the toad that it is "the most deformed and hideous of all animals," which it is not; and the epithet of "venomous," which Milton applies to it in his picture of Satan, is singularly inaccurate. In reality, the toad is one of the most harmless and inoffensive creatures in existence. Let it alone, and it will hop out of your way; the fluid which exudes from some parts of its body is innocuous; and its bite produces nothing but a very slight inflammation. On the other hand, it is extremely useful in devouring grubs and vermin injurious to plants, and hence enjoys the special protection of the gardener.

It has frequently been said that the first example of the art of navigation was given to mankind by a mollusk common in the Mediterranean, the name of this mollusk being the nautilus, or argonaut. It is usually represented with six arms, extending over the sides of the shell, as if to act as oars; and two arms, which have broad disks upraised, as if to act as sails. Much beautiful poetry has been devoted to the celebration of this zoölogical error:

"Learn of the little nautilus to sail,
Spread the thin oar, and catch the driving gale,"

says Pope. Montgomery, in his picture of the nautilus, writes:

"The native pilot of this little *bark*
Put out a *tier of oars* on either side,
Spread to the wafting breeze a *twofold sail*,
And mounted up and glided down the billow
In happy freedom."

And Byron this:

"The tender nautilus who *steers his prow*,
The sea-born *sailor* of his shell *canoe*,
The ocean Mab, the fairy of the sea,
Seems far less fragile, and, alas! more free."

Unhappily for the poets, the nautilus never moves in the manner here described. It can creep along the bottom of the deep; it can rise to the surface

and float, moving backward through the water like other cuttle-fish. But the arms are not used as oars, and those which have the expanded membranous disk are never hoisted as sails. The sole purpose of these limbs is the secretion of the substance of the shell, both for its repair when injured and for the enlargement which the growth of the animal may require.

In the fossiliferous rocks the nautilus occurs among the earliest traces of the world's animal life. It continued through the long ages during which the family of its conqueror, the ammonite, was created, flourished, and became extinct. Mrs. Howitt has made this fact the subject of some graceful lines, which are not accurate, however, as to the formation of the stratified rocks, the habits of the mollusk, or the disappearance of its cousin-german:

"Thou didst laugh at sun and breeze,
In the new-created seas;
Thou wast with the reptile broods
In the old sea solitudes,
Sailing in the new-made light,
With the curled-up ammonite.
Thou surviv'dst the awful shock,
Which changed the ocean-bed to rock,
And changed its myriad living swarms
To the marble's veined forms.

"Thou wast there; thy little boat,
Airy voyager! kept afloat,
O'er the waters wild and dismal,
O'er the yawning gulfs abysmal;
Amid wreck and overturning,
Rock imbedding, heaving, burning,
'Mid the tumult and the stir;
Thou, most ancient mariner,
In that pearly boat of thine,
Sail'dst upon the troubled brine."

It remains to be said that the stratified rocks were formed by slow deposition, often in tranquil waters, and not by sudden catastrophes; that the ammonites did not perish from convulsive movements of land and sea; but that the family runs through all the formations from the silurian to the chalk, had its greatest development in the Oölitic period, and gradually died out.—*Appletons' Journal.*

WHEAT grains have a vitality which resists intense cold. A sample of the wheat left by the Polaris, in 1871, in 81 degrees and 16 minutes north latitude, and exposed to a temperature varying from that of summer to that of winter in that position for five years, was sown last year by Dr. Schanburgh, of the Botanic Gardens and Government Plantations, South Australia, and out of three hundred grains sixty germinated and produced plants, three and four feet high, with ears containing thirty grains each.

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CORRESPONDENCE.

SCIENCE LETTER.

PARIS, FRANCE, August 30, 1878.

Perhaps Parisians are more occupied at the present time with the subject of hydrophobia than with their Exhibition. The average daily number of mad dogs executed, wherever found, is ten, and the proclamation on the part of the authorities to deal summarily with wandering dogs or cats, bitten by enraged dogs, is Draconian in its clauses. Some people blame the sun for the mischief; others attribute the cause to muzzling the animals. All is confusion respecting dog madness and hydrophobia. There would be no hydrophobia if there were no mad dogs; and none of the latter if they were not bitten by an enraged animal. Though inseparably related, hydrophobia and dog madness are not identical. It is indisputable that canine madness produces madness; the same cannot be so clearly alleged respecting hydrophobia, and the errors respecting the latter malady arise from its not having been methodically studied by doctors, many of whom have never had, happily, a case to deal with. It is curious that hydrophobia patients even share the errors current respecting this disease, concluding they are dangerous and begging their friends to keep out of their reach. These delusions explain in part the cruel remedies, &c., employed in the country districts for hydrophobia patients. The symptoms of the disease are perfectly defined, and are the same with the intelligent individual, the child, and the idiot.

The period of incubation of the virus varies, and this is not the least painful element in the event of being bitten by a dog; sometimes the disease will not manifest itself for six weeks or three months; the symptoms have appeared in eighteen days, and have only declared themselves in a very few and abnormal instances in five and seven years, owing it is supposed, to the virus having failed to enter earlier into the circulation. The symptoms of hydrophobia are, extreme nervous irritibility; terror; spasmodic contraction of the muscles of the throat excited by external influences, as the sight or noise of water. When the sufferer attempts to swallow a portion and succeeds, he not the less involuntarily turns his head aside; he experiences the sensation of being strangled, not only by the sound of falling water, but by passing a looking-glass before the eyes, or by the movement of an insect on the skin. Delirium follows this irritability; hallucinations succeed, mucus accumulates in the throat and mouth, and the patient in endeavoring to remove it, makes a noise, that the ordinary observer concludes resembles the barking of a dog; the feet are paralysed, and in endeavoring to walk firmly the patient falls, and hence the popular conclusion of crawling like a dog. Retchings ensue, the pulse becomes quick and weak, and death ensues

within twenty-four hours after the first symptoms. The agony can extend to even seven days. Frequently extreme tranquillity precedes death, the patient eats, drinks and talks rationally, but this deception is of short duration.

The difference between tetanus and hydrophobia is marked; in the former, the spasm is excited by the slightest touch; it is rigid, and weakens gradually away; there is neither thirst, retchings, nor foam at the mouth. In the case of hydrophobia the spasm is sudden and frequent—a convulsion. The symptoms of madness in the dog are well known, owing to a larger field of observation. The principal is a total change in the habits of the animal, which becomes somber and restless, incessantly licking the part bitten; if at the ear, he rubs the old wound; if at the foot, he gnaws it to the very bone; his appetite is eccentric; he devours morsels of thread, cord, silk, straw, &c.; is quarrelsome; if chained up, he will gnaw his wooden box, and will attack all the dogs he meets; the second day foam appears at the mouth, burning thirst ensues, which causes the animal to employ his paws against his throat to expel, as it were, some obstacle; in these efforts the animal trembles, for the legs are paralysed, also the muscles of the lower jaw, since the latter hangs and consequently the mouth remains open; the tongue is free. The dog will now begin to stare at some imaginary object, and to follow some invisible route; there is a strange hoarseness in the bark; the respiration is oppressive. On the fourth or fifth day the dog dies in convulsions or sometimes calmly.

It is a popular error to suppose that the afflicted man or dog dreads water; on the contrary the dog has great thirst, goes where he perceives water, plunging his head therein, but is unable to lap any up, the lower jaw being paralysed. It is inexact to believe that the healthy instinctively recognizes the diseased dog. The fox, wolf and cat can become mad like a dog; the virus of the wolf is peculiarly dangerous; of one hundred and fourteen persons bitten by this animal in France, sixty-seven perished. There are authorities who assert that the bite of a mad dog is not mortal, and those who succumb do so from fear. When one has been bitten it is better to isolate and tie up the dog than to kill him, for the person can thus become assured if the animal were mad; when destroyed, the stomach of the dog ought to be examined to ascertain does it contain bits of straw, morsels of thread, &c. When bitten, the person ought to tie a string or band above the wound very tightly to prevent the virus being circulated, and to continue pouring cold water from a height for an hour, to wash out the virus, perhaps. By this time a doctor's aid shall have been obtained, either to cut away the wounded flesh or sear it with a red hot iron, or even amputate the member. Magendie and Dupuytren have shown that excessive heat is no more productive of canine madness than excessive cold. The former physiologist inoculated two dogs with the virus from an hydrophobia patient; one of the animals only went mad Canine madness or rabies does not always exist where there are dogs; it is unknown in Borneo, in regions of Brazil, in New Zealand, Tasmania and Australia according to some writers; in Constantinople where the dogs act as scavengers, and with the Esquimaux.

Connected with the Exhibition buildings there is a curiosity in the matter of ventilation. In the Champ de Mars the air rises from subterranean galleries through the floor and escapes by the lattice-work of the roof; in the Trocadero round room the cold air is pumped up from the catacombs to the fan light of the ceiling, from whence it descends and is distributed by orifices placed beneath each seat. This explains why the room can never be lighted with gas, the cold air at the ceiling would fan the flame downward; beside, it is intended only to employ the electric light. The vitiated air on the contrary is sucked upward, and escapes by the roof. The room is capable of containing 5,000 spectators, each of whom is allowed forty-four cubic yards of air; it is thus necessary to supply the hall with sixty yards of fresh air. This is effected by means of machinery, and all currents of air and draught sensations are avoided by the incoming stream being driven with a force one-sixth stronger than the outgoing, and both representing a pressure hardly superior to the external air; the latter is proportionally mixed with that of the colder, from the catacombs, to obviate chills.

The two galleries devoted to machines are the most popular part of the exhibition; they form the lateral boundaries of the Champ de Mars, constituting as it were its boulevards. They are thirty yards high and forty wide. Shafts run along the galleries, communicating the motive power to the machines; the shaft makes about one hundred and twenty revolutions per minute. The French gallery is divided into eleven groups, and the shafts, driven by five sets of boilers, represent a total of 1,300 horse-power; the foreign gallery has only five of its eleven groups occupied by machinery in motion, and four sets of boilers representing 1.055 horse-power; the aggregate total horse-power is four times greater than in 1867. Coal is the only combustible used for generating heat, and the same sun that causes the trees to grow and the flowers to bloom in the park, developed these plants that were changed into the coal now burned, ages before man's appearance on the globe. In the galleries the steam engine predominates; in the way of types there is nothing positively striking, save that they are simpler. Two types remain intact; the old balance machine of Watt, so uniformly regular in its movements and so well suited for a relatively slow speed, and the horizontal machine, with single and double cylinders, capital for quick work, cheap, but wearing rapidly and costly to keep. Though inventors claim their ameliorations to be the most superior, the engineer demands a machine that utilizes the steam in the best conditions possible. There are two camps represented by "Corliss" and the "Compound" engines; the public generally believes these names represent something wonderful in steam engines. Now a steam engine is the simplest piece of mechanism in the world; it is merely a closed cylinder in which a piston works; the steam coming from the boiler at one end pushes the piston, and when the latter arrives at the end of its course an orifice opens and allows the steam to escape into the atmosphere; at one end of this go-and-come piston is a rod connecting a crank which sets a shaft in motion. Such is the steam engine. All improvements in the latter have two ends in view, to economize the power of steam when entering and when within the cylinder, and to produce the greatest

amount of steam at the smallest expenditure of combustible, or, in other words, to prevent the loss of heat. The Corliss condensing engine utilizes the steam in a very effective manner. Engines expend more steam in practice than they ought to do theoretically, the difference ranging from fifty to sixty per cent. This loss is attributed to the manner in which the steam is distributed on entering the cylinder, and its condensation on the sides even of the cylinder itself. To prevent the cooling tendency of the latter, Watt had the cylinder surrounded by an envelope of steam, and his idea though then discarded has been of late years taken up. The "Compound" engine deals with this fact, and the thousands of machines constructed on the principle, explains its practical success. The system is about being applied to locomotives by M. de Freiniuville. It has been demonstrated that heat and force are synonymous; so much heat, so much force. The best machines require about two pounds of coal per hour per horse-power; they do not transform in work more than eight or ten per cent. of the heat produced in the furnace; in ordinary steam engines it descends even to five and two per cent.; the loss is thus ninety-five per cent! This enormous waste is produced on all sides, in the furnace, the boilers, &c. The gas machines, very imperfect in point of construction when compared with a steam engine, produce a relative amount of work at three-fourths less of heat, because the furnace or center of combustion is inside the machine, and the waste or leakage of heat is thus reduced. Hence, while steam engines are nearly perfection, the apparatus for generating heat and storing the steam is still in its infancy.

Since a century, persons have labored to discover a motive power other than steam, and the Exhibition proves that the gas engines of Messrs. Otto & Simon can practically cope with the steam engine as far as to five horse-power. The Otto is an air machine, heated by ordinary gas, inside the cylinder even. It consumes not more than a thousand quarts of gas per hour and per one horse-power, and requires only thirty-five quarts of water to keep the cylinder cool. The success of the gas engine has cut out warm air as a motive power; indeed the former is only a heated air machine perfected. Hydraulic engines are useless in towns where water costs so dear, where they could only be adopted by workmen laboring in their own houses. Electricity is not to be thought of as a motive power; by simply turning a magno-electric machine a great deal of electricity is generated by a small expenditure of force; but the opposite fact is true, that with a great deal of electricity very little motive power is produced. The electric piles only work by oxydizing zinc, and expend as much zinc as a steam engine does of coal. Now zinc is fifteen times dearer than coal, and yields three-fifths less of force; its cost then would be about thirty times dearer than coal. At the present stage of mechanical science, therefore, the best motive power for great engines is steam, and for small machines, gas.

Dr. Donnē, whose recent death science has to deplore, was a great advocate of milk as a curative agent. The present Count de Paris, when two years of age, was given up as a lost child; the Doctor was allowed to experiment as he

pleased, and quickly restored the health and strength of the child, now a very robust man. It was Donnē who demonstrated that fresh milk is always alkaline; his advice to mothers was sound: "never rear your infant yourself when you cannot, if you desire to save it from rickets, scrofula and consumption."

Some posthumous papers have been found, a series of notes, the last written by Claude Bernard, asserting that M. Pasteur's theories on fermentation are erroneous, and that germs of fermentation do not come from the external air. This raises the question of spontaneous generation, with Bernard in its favor. But the friends of Claude Bernard suggest that the notes found were only intended as a programme of experiments contemplated; if such were not their aims, M. Pasteur objects to C. Bernard's views, and invites his friends to come and test their practical contradiction in the laboratory. It is a great problem, not in the sense of spontaneous generation, for Pasteur maintains life is the product of antecedent life created by a supreme will, but of contagious affections and decomposition, for fevers and such ailments are generally believed to be the product of germs floating in bad atmospheres. F. C.

THE FOSSIL INSECTS OF COLORADO.

MANHATTAN, Kansas, September 2, 1878.

Editor of the Western Review:

The remarks of Prof. C. E. Robins, on page two hundred and seventy-six, of the August number of the REVIEW, call for an explanation. My statements on the fossil insects and plants found by me in South Park, were not written out by me, but were a *very condensed* report of what I said in a lecture before the Kansas Academy of Science. The report should have stated that the insects and plants were of a semi-tropical character, such as now could live in a country like Florida, on a level with the ocean; and, consequently, such species could not live in the latitude of Pike's Peak, at an altitude eight thousand (8,000) feet above the sea. Prof. Robins will readily recognize the fact that classes of insects, from such diverse surroundings, always have a different aspect; the ants from the tropics and temperate zones illustrate this trait, or type, of animal life.

I also stated that the difference of climate, which would allow semi-tropical insects and plants to live where we found them, could be explained by allowing the Rocky Mountains to have arisen less than half of their present altitude, leaving the "plains" under the ocean. The Rocky Mountain region would then have existed as a cluster of islands, with wide oceans on all sides. If warm currents had then flowed, as in the Gulf stream, from the tropics, the South Park, being on a level with the sea, would have had a semi-tropical climate, and would naturally have been supplied with insects and plants of the kinds we find fossilized.

The total vertical thickness in which we find these fossils is two hundred feet, the material consisting, for the most part, of fine sand, clay and lime. This

gives us some idea of the long period during which the mountains stood still in their upward motion, or moved so slowly that all this sediment could have been deposited while the level of South Park was not so much above the ocean as to affect its climate.

These deposits are all horizontal and undisturbed. This gives us another lesson on the growth of mountains, viz: that the subsequent upraising of about eight thousand feet must have been slow and gradual, without convulsions, or these frail insects could not have been preserved in such delicacy. Prof. S. H. Scudder finds the most minute down, or feathers, on the wings of the butterflies, still preserved. The fine net veins on the leaves of the Dicotyledonous plants are as clearly retained as on a leaf from a growing tree; all the facts point to a slow upraising of the mountains, amounting to only a few feet in a century.

I do not claim to be authority on entomology and botany, as those sciences are not my specialty; Prof. Scudder has visited the spot, and the plants have been sent to Prof. L. Lesquereux, and both concur as to the semi-tropical character of the fossils. Yours respectfully,

B. F. MUDGE.

ELEVATION OF KANSAS RIVER.

Editor of Western Review of Science and Industry:

As a matter of some interest to your readers, I herewith give you the monthly average elevation of the Kansas river above low water of 1874. This average is obtained from the daily record kept by myself at the Kansas City Stock Yard Exchange building, from June 10th, 1877, when it stood at twenty-six feet, three inches, the highest since 1844 to the present time. The record is as follows:

1877.	ft.	in.	1878.	ft.	in.
June	20	7	January	6	11
July	16	11	February	10	3
August	10	3	March	8	4½
September	6	11	April	9	11
October	6	11	May	13	7½
November	6	8	June	19	0
December	7	4½	July	18	6½

Respectfully Yours,

H. P. CHILD.

METEOROLOGY.

MISSOURI WEATHER SERVICE, SEPTEMBER, 1878.

BY FRANCIS E. NIPHER, DIRECTOR.

At the St. Louis station during the past September, the average temperature has been 68.9°, the normal temperature being 69.1°. The extremes of temperature were 88° on the 8th, and 44° on the 12th. In 1864 Dr. Englemann observed a September temperature of 102.5°, while in 1839 a temperature of 35° was noted.

The temperature of the month was therefore normal. In the State the mean temperature has been, at Corning and Oregon, 66.7°, Boonville, 67.8°, Lebanon, 67.2°, Kansas City, 68.5°, Lexington, 69.1°, Neosho; 68.7°.

On the 11th frost was observed over the region north of a line drawn through Sedalia and Hannibal (M. K. & T. R. R.,) while on the 12th and 13th the frost line passed through Neosho and St. Louis, being marked approximately by the St. Louis and San Francisco R. R. On the 21st and 26th the frost line is marked by the Missouri river. Ice is reported to have formed at Big Creek, (south of Lincoln county) on the 12th and 21st, but was observed at no other station. Vegetation is everywhere unharmed on the uplands.

On the 23d a hail storm at Macon covered the ground with hail stones about three-eighths of an inch in diameter. At the central station the rain-fall has been 3.93 inches, an excess of 0.94 inch over the normal rain-fall. In 1871 the September rain-fall was only 0.02, while in 1866 it reached 10.53 inches. Ten times in forty-two years the September rainfall has exceeded that of last September.

In the State the area of greatest rain-fall (over three inches) is bounded by the Iron Mountain and the St. Louis and San Francisco railroads, while the belt of least rain extends along the Missouri, Kansas & Texas R. R., including also the northeast part of the State. In the northwest part of the State, the rainfall again exceeds two inches.

Observers who do not note the time of beginning and end of rains, are earnestly requested to do so, as it will double the value of their work.

KANSAS WEATHER REPORT FOR SEPTEMBER, 1878.

BY PROF. F. H. SNOW.

STATE UNIVERSITY, LAWRENCE, KANSAS.

Mean temperature, 67.58°, which is 1.02° above the average September temperature for the ten preceding years. The highest temperature was 94.5° on the 4th, the lowest, 41° on the 11th. There was no frost at our station, though a very light hoar frost was observed on the low lands in some portions of Douglas county. The mean temperature at 8 a. m., was 61.17°, at 2 p. m., 79.18°, at 9 p. m., 67.58°. The mercury reached 90° on six days. The highest average temperature (79°) was reached on the 30th.

Rain, 2.51 inches, which is 0.70 inch below the September average. Rain fell on seven days. There were two thunder showers. The entire rain-fall for nine months of 1878 now completed has been 34.51 inches, which is 5.68 inches above the average amount for the same period for ten years.

Mean cloudiness, 30.66 per cent of the sky, the month being 3.37 per cent clearer than usual. Number of clear days, 19 (entirely clear, 7); half clear, 7; cloudy, 4; (entirely cloudy, none).

Wind, southwest. 34 times; southeast, 19 times; northwest, 18 times; north, 6 times; east, 5 times; northeast, 4 times; south, 3 times; calm, once. The entire distance traveled by the wind was 12,245 miles, which gives a mean daily

velocity of 408 miles, and a mean hourly velocity of 17 miles. The highest velocity was 45 miles an hour, on the 30th, on which day the total distance registered was 969 miles.

Relative humidity, mean for the month, 66.4; at 7 a. m., 30.8; at 2 p. m., 44.7; at 9 p. m., 73.7. Greatest, 94.4, on 19th; least, 31.7, on the 16th. There was no fog.

COLORADO WEATHER REPORT—SEPTEMBER, 1878.

BY PROF. C. E. ROBINS, SUMMIT, COLORADO.

Highest temperature, 61°; lowest temperature, 20°; mean temperature, 35.7°; total snow-fall, 5 inches; total rain-fall or melted snow, 1¼ inches; prevailing wind, west; maximum velocity, 40 miles an hour; number of days on which rain or snow fell, 11; number of cloudy days, 6.

A brief summary of an attempt to grow vegetables at an altitude of 11,300 feet (lat. 37° 28′ 18″ N., long. 106° 30′ W.) may be worth setting down:

June 14; so soon as ground was clear of snow, radish and turnip seeds were sown. June 26; maize, Mexican beans, dwarf peas, Irish potatoes, beets, kohl rabi, nasturtium, parsley and spinach seeds planted. June 29; lettuce sown. July 13; peas up. July 20; potatoes up. July 25; corn, beets and spinach up. July 31; radishes ripe. August 1; nasturtiums up. September 1; frost destroyed maize, Mexican beans, nasturtiums and foliage of potatoes. September 7; ground covered with snow. September 9; Heavy frost, blighting tops of peas and beets. September 20; everything in garden dead except lettuce and spinach, latter holding out best.

Radishes (roots) grew to be 5 inches long and ½ in. thick; turnips, to be ¾ in. in diameter; maize (stalks), to be 3 in. high; Mexican beans, ditto; peas, 5 in. high and blossomed, no fruit; potato stems, grew to be 6 in. high, ¾ in. longest diameter of tubers; beets (roots), 4 in. long ⅛ in. thick; kohl rabi and parsley did not come up; nasturtiums grew to be 1½ in. high; spinach and lettuce grew 3 in. high and show about one-half green and one-half dead leaves at this date, 1st October. No snow on ground.

BOOK NOTICES.

ELECTRIC LIGHTING. By Hippolyte Fontaine. Translated from the French by Paget Higgs, LL. D. E. & F. N. Spon, London and New York, 1878; pp. 194, octavo. Cloth; fully illustrated. For sale by M. H. Dickinson.

When Alessandro Volta, a little more than one hundred years ago, invented the electrical instrument named after him, the Voltaic Pile, it probably would have been regarded by him as impossible that its capabilities, or rather those of

the Voltaic arc, should ever become so developed as to become the most efficient means of illuminating immense factories, whole streets of cities, etc. Such, however, is the fact, and the work above named is devoted to recording the history of Electric lighting from the time of Sir Humphrey Davy, who was the first, in 1813, to observe the Voltaic arc, down to the experiments of King, in 1847; Le Roux, in 1867, and Jablochkoff, in 1877. Any one who has only had his attention called to the subject by the recent numerous discussions of it in the newspapers, will be surprised, upon reading this book, to find that as long ago as 1846 the electric light was introduced at the Opera in Paris, and has ever since been used, producing the magnificent effects of the rainbow, lightning, sunrise, luminous fountains, etc., and that from that time to this it has been found of increasing value in illuminating mines, railway works, the docks and harbor of Havre, the Paris Exhibition of 1878, in the Trocadèro and in many other extensive works where continuous labor, day and night, was necessary. The amount of ingenuity, labor and time which have been expended and wasted upon electric lamps since 1844 is perfectly appalling, and no experimenter on the subject should devote another hour to it without first consulting M. Fontaine's work, and there, by reading the numerous descriptions of carbon regulators—whether failures or not—learning to avoid repeating the errors of hundreds, who have gone before them and failed, or giving way to impracticable ideas.

The various branches of the subject such as electric lamps, electric carbons, magneto-electric machines, the Gramme machine (which seems to have been applied to nearly all kinds of industrial and mechanical machinery and has been found especially adapted, as the author claims, to the production of electric light for factories, forts, light-houses, ships, &c.,) cost of electric lighting and divisibility of electric light—all are treated fully and attractively, and with great apparent candor.

Certain it is that the subject is one whose adaptability to the requirements of society is yet far from fully developed, for while M. Fontaine remarks that "there is at the present time (1878) no sufficiently practicable system of dividing the light as to render it generally available for the purposes for which gas is used," our Prof. Edison has nearly or quite succeeded in dividing it so as to make it applicable to the dwelling house as well as the street and work-shop.

Among the advantages of the electric light over that of gas, candles or kerosene are those of hygiene, since it consumes no fresh air, while all of the others consume it enormously; economy, since at the present price of gas, even at its cheapest, the cost of the electric light is far below it; certainty of production, since, while the materials for producing gas may fail, those required for the other are always present in inexhaustible quantity; and lastly, perfection of illumination, since it does not alter even the most delicate shades of color, whether of vegetation, fabrics or ladies' complexions, and at the same time penetrates the densest fogs of the sea coasts.

The Messrs. Spon have spared no pains to make this book itself attractive in typography, illustrations and binding.

XUM

SCIENTIFIC MEMOIRS. By John William Draper, M. D., LL. D. New York, Harper & Brothers, 1878, pp. 473, octavo. Illustrated. For sale by M. H. Dickinson, $3.00.

For more than forty years Dr. Draper has been a hard student, careful investigator and prolific writer upon scientific subjects. The first of his works brought to our personal observation was his treatise upon Human Physiology, published more than twenty years ago, which at that time was regarded by the profession as by far the most advanced work which had been put forth on the subject, containing, as it did, the results of many experiments and explorations new to the world. Even yet this work maintains a high position among kindred works.

The volume under consideration includes only certain papers connected with the effects of Radiations or of Radiant Energy, which have been published in various journals, pamphlets and transactions of learned societies in different parts of the world, and which have never before been brought together. These papers were awarded the Rumford medal by the American Academy of Science for discoveries in light and heat, and probably comprise more original research and ingenious and successful experimentation in these branches of physics than any other series in use.

While sufficiently technical for the most scientific reader, these papers are written in an admirably easy and perspicuous style, so that they become clear and attractive to the ordinary reader. For instance, the chapters upon the examination of the radiations of red hot bodies, the production of light by heat, spectrum analysis, photography, the electro-motive power of heat, the cause of the flow of sap in plants and the circulation of the blood in animals, are equally interesting to the *savant* and the college student, while all the others, though perhaps more abstruse, are full of instruction to those interested in the subjects discussed. Among these may be mentioned the chapters on the diffraction spectrum, the effects of heat upon phosphorescence, analogies between the phenomena of the chemical rays and those of radiant heat, the chlor-hydrogen photometer, &c.

The work is profusely illustrated and is gotten up in Harper Brothers' best style, which, with the well-known reputation of the author as a life-long investigator, a most accurate observer, and as a writer possessed of an elegant style and profound stores of learning, will certainly give it a large circulation among reading people.

THE DRUGGIST'S RECEIPT BOOK. By Henry Beasley. Philadelphia, Lindsay & Blakiston, 1878; pp. 510, 12 mo., $2.50.

This work, now in its eighth edition, comprises a copious veterinary formulary, numerous recipes in patent and proprietary medicines, druggists' nostrums, perfumery and cosmetics, beverages, dietetic articles and condiments, trade chemicals, scientific processes and an appendix of useful tables, foreign weights and measures, chemical symbols and equivalents, etc., etc.

XUM

It is exactly what all apothecaries and pharmaceutists need for daily reference and for valuable instruction in the art of compounding medicines and chemicals, and especially will it be found useful in the West where the druggist is frequently the doctor, and *vice versa*, and both are expected and frequently compelled to prepare and dispense medicines of all kinds. Besides this there are many recipes and directions for the preparation of dietetic articles for the sick, which are indispensable in the household, not to mention the numerous formulas for preparing medicines for horses, cattle, sheep, dogs and poultry, which render it important to the farmer and stock raiser. For the money, it is the most comprehensive and complete work of the kind we have ever seen.

ON THE PLAINS AND AMONG THE PEAKS. By Mary Dartt. Philadelphia, Claxton, Remsen and Haffelfinger, 1878; 12 mo., pp. 237. Cloth, $1.00; paper, 50 cts.

The collection of the animals and birds of Colorado, shown by Mrs. Maxwell at the Centennial, attracted so much attention on account of its extent, the skill of the taxidermist who prepared them and their artistic arrangement, that it was found necessary to prepare a little history of the whole collection and its owner to avoid the wear and tear of answering the innumerable questions of the sight-seers who crowded the Kansas and Colorado building.

The above book is thus accounted for, and purports to give an account of how Mrs. Maxwell became a naturalist, how she made her collection and of many of the incidents connected therewith. It is written in a natural and piquant style and is full of wild scenes of adventure and danger which attended her pursuit and capture of most of these animals, for it must not be forgotten that Mrs. Maxwell hunted, shot and stuffed nearly all the animals in her wonderful collection, from the grizzly bear to the turkey buzzard, and that such feats are not easy of accompiishment even by the most experienced and hardy hunter.

In an appendix, Dr. Elliott Coues, U. S. A. and Prof. Robert Ridgway give complete technical lists and descriptions of all the animals and birds in this remarkable collection, which lists occupy more than ten pages. The work will abundantly repay the general reader, while the appendix gives valuable information to the naturalist and the sportsman.

HOW TO BE PLUMP. By Dr. T. C. Duncan. Chicago, Duncan Brothers, 1878; 12 mo., pp. 60. Cloth, 50 cents.

This is a little book on a large subject, but one that is much needed in society, where the tendency of its members generally is to unnatural and ungainly leanness. The rules laid down are altogether physiological and hygienic, and if carried out faithfully will accomplish the desired object. It should be read and studied by all mothers and fashionable ladies, but especially by those who are growing thin from any cause.

OBITUARY NOTICES.

PROF. F. W. BARDWELL, M. A., C. E.

Prof. Bardwell will be remembered by our citizens as one of the members of the Kansas Academy of Science present at its semi-annual meeting in this city last summer. His address delivered at that time upon "River Navigation," was a masterly effort, and his genial manners made him many friends. Since then he has published a pamphlet upon "The Method of Arithmetical Instruction," and more recently an exhaustive work of Arithmetic.

Prof. F. H. Snow, President of the Kansas University, writes as follows:

"I enclose a brief account of Prof. Bardwell, from the Lawrence *Journal*, received a day or two ago. I know of no other facts in his life of interest to the public generally. His death is a great loss to the University and a personal bereavement to myself, as our relations were of the most intimate character. I left him three weeks ago on a sick bed, but did not apprehend a fatal result. He was then suffering keen disappointment that he had not been able to take observations upon the eclipse at Pueblo, where he had put up his instruments. But we know not what a day may bring to us, and I am confident that all is well with him."

"At twenty minutes before two o'clock, Saturday afternoon, Professor Frederick W. Bardwell, professor of astronomy and engineering in the University of Kansas, died at his home in this city, at the age of forty-six years, after an illness of only about three weeks. The sad announcement, though there had been much forewarning of its approach, fell with crushing severity upon the minds of our people. Prof. Bardwell, since his coming to Kansas, has been recognized by all classes as a scholar of great accomplishments, a citizen of model deportment and a gentleman of perfect quality. Those who have enjoyed his personal friendship have found in him rich stores of that frankness, sincerity, gentleness, and genuine uprightness of character which alone can make a friend in name a friend in fact. In the University he was one of the strongest members of the faculty, and it is there chiefly, perhaps, that he will be missed and mourned.

"Prof. Bardwell was born in Belchertown, Massachusetts. His father died when he was four years old, after which event he lived with relatives until the twelfth year of his age. After that date he earned his own livelihood, working on farms in the summer season, and in the winter time either going to school or teaching, as circumstances permitted. In this manner he worked himself through Harvard College. In this time also he was employed much on the Nautical Almanac, a scientific work of much importance.

"After graduating from Harvard, Prof. Bardwell accepted a professorship at Antioch College, Yellow Springs, Ohio, of which institution Horace Mann was then president. Before Prof. Bardwell left Antioch, President Mann was succeeded by Thomas Hill, since President at Harvard. With both these men Prof. Bardwell was associated on the most intimate terms.

"When the war opened, Prof. Bardwell left Antioch to enlist as a private. He was soon promoted, however, and was finally made colonel. At the close of

the war, in company with others, he went into the culture of cotton on a Florida plantation, withdrawing after three years of ill success. It is told in this connection that every man of the many laborers in his employ was paid fully, lhough he himself was left with absolutely nothing, save, of course, a mind conscious of its own rectitnde.

"From Florida Prof. Bardwell returned to Massachusetts, and was soon called to a position in the Naval Observatory at Washington, where he did excellent work for two or more years. His health there was not good, and thinking to improve it, he accepted the proposed professorship of mathematics in the University of Kansas. By a recent promotion he was made professor of astronomy and engineering—the chair now made vacant by his death."

THOMAS BELT, F. G. S.

PLEASANT HILL, MO., Sept. 28, 1878.

MR. CASE, *Dear Sir*:—I was shocked to see a notice a few days ago of the death in Kansas City on the 21st, of Mr. Thos. Belt, F. G. S. I met him in St. Louis in 1874. Since then he sent me an interesting paper on "Niagara Falls, its Surface Geology," showing that he had studied it very closely, and at a subsequent visit I found his pamphlet of much use. He has written much on glaciers and investigated their effects all around the world. He sent me from London a volume of his work entitled "The Naturalist in Nicaragua," a very interesting book giving an account of his residence there for over two years while superintending some gold mining operations there for an English company.

Less than two months ago I received letters from him in which he spoke of his studies in the drift of Colorado, of a skull he had found there, and he expected to have had a paper prepared for the American Association for the Advancement of Science, on the subject, but failed in completing the details.

It is hoped that ere his insane spell came on he had completed this work. He was one of the best authorities on glaciers. Some of his papers may be found in the proceedings of the Geological Society of London. His death is a great loss to science.

Respectfully, &c.,

G. C. BROADHEAD.

Mr. Belt was a man of rare attainments and said to be one of the finest mining experts in the country. He represented certain English capitalists, interested in mines, who have depended upon his investigations and advice in investing money in mines in different portions of the globe, from Australia to the Rocky Mountains. He had but just returned from a business trip to Deadwood, where he was much exposed, resulting probably in inflammation or congestion of the brain. For several days before his death he was quite insane, his madness taking the form of harangues on scientific subjects, which, though wild and eccentric in manner, manifested a high degree of scholarship and knowledge of the subjects. He was about thirty-eight years of age and a man of great energy and ability. He had published several pamphlets beside the works mentioned by Prof. Broad-

head above, among which were "The Glacial and Post-Glacial Phenomena of Niagara," and "An Examination of the Theories that have been Proposed to account for the Climate of the Glacial Period."—ED.

DR. AUGUST HEINRICH PETERMAN.

This distinguished man died of apoplexy, at Gotha, Germany, on the 27th of September, after a very active life devoted almost exclusively to geography. He was born in April, 1822, near Nordhausen in Prussian Saxony, and was consequently but in the prime of life. He was educated at Potsdam and remained there a number of years acting as private secretary for the famous Professor Berghaus, and assisting in the preparation of his "Physical Atlas." Subsequently he prepared a map of Central Asia for Humboldt, of whom he was a warm friend. In 1845 he was in Edinburg assisting Prof. H. K. Johnson with his "Physical Atlas," and in 1847, at London, united with Rev. Thomas Milner in preparing a "Physical Geography." While there he became a member of the Royal Geographical Society, and contributed valuable accounts of the progress of Geography to the *Athenæum*. African exploration owes much to him, while his hypotheses in regard to an open polar sea were supported by Dr. Kane's discoveries. In 1854, at the age of thirty-two, he was given the chair of Geography in the University of Gotha, and soon after had conferred upon him the title of Ph. D. by the University of Göttingen. He subsequently superintended and published a monthly Journal of Geography at Gotha, called the *Mittheilungen*, which, up to the time of his death was regarded as the standard authority of the world on this subject. An exchange says:

"It was from his diligent examination and comparison of thousands of log books that the course of the Gulf Stream, as at present recognized, was mapped out, and his death seems even yet more inopportune and sad, because it has occurred so soon after Captain Coffin, of the brig "Dirigo," has impugned the accuracy of some of his calculations, and before he could possibly have time either to lay down an amended chart or prove the errors of Coffin's statements."—ED.

EDITORIAL NOTES.

ON the 27th ult. Maj. F. G. Adams, secretary of the Kansas State Historical Society, in company with Dr. Fryer of the United States army and Dr. R. J. Brown and several other members of the Academy of Science of Leavenworth, visited a spot on the high ridge west of Fort Leavenworth known as Sheridan's Drive, to look for the traces of the Mound-builders described by United States Surveyor McCoy in 1830. The spot described in the report was found at a point about one mile west of Fort Leavenworth, and after some work among the undergrowth of hazel bushes six mounds of small size were discovered. One of them was opened, and at a depth of four feet two stone walls parallel to each other about six feet apart were found, and at one place an arched covering of stone. The in-

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ner sides of the rocks, which had evidently been carried to the top of the ridge, which is about twelve hundred feet above the sea level, indicated that they had been subjected to an intense heat at some time. Much interest is manifested in the reports of the exploration among scientific men of Kansas, and a thoroughly organized force will make further excavations soon, when it is thought much of scientific importance will be developed. These are believed to be the first unmistakable traces of the Mound-builders discovered west of the Missouri river with the exception of one or two mounds in Jackson county, Mo.

WE are indebted to Captain Howgate, U. S. A., for an illustrated copy of his Memorial to the 45th Congress in behalf of an appropriation for the support of an exploring expedition to the Polar regions of North America. It seems to be a stigma upon our national reputation for enterprise and energy that Congress should be so long in making the small appropriation asked, when other nations, less directly interested, and even private individuals, are doing and have done so much in the cause. Doubtless, however, the appropriation will be made during the coming session and the expedition started early next Summer. In the meantime the Florence, sent out by Capt. Howgate last year to prepare the way for the expedition expected to be provided for by Congress shortly afterward, has been announced as returning home, and Capt. Tyson and his brother officers will be able to furnish all the necessary information required to render such an appropriation most useful and effective, at the same time that Messrs. Sherman and Kumlein, the naturalists who accompanied the expedition on the part of the Smithsonian Institute, and who have, according to the report brought in by Captain Roach of the Helen F., devoted themselves most assiduously to the objects for which they were sent out, will be enabled to give additional scientific reasons for a thorough national exploration of this the modern *Ultima Thule*.

WE have received numerous complimentary letters from scientific gentlemen in different portions of the country lately, commenting favorably upon the quality of the articles furnished in the REVIEW and its general style and make-up; also, many handsome notices by our friends of the periodical and newspaper press on both sides of the Atlantic, which evidences of favor are, of course, highly gratifying to us and well calculated to stimulate us to still greater efforts to make the REVIEW a worthy medium for giving to the public the best thoughts and experiences of western scientists.

THE oldest specimens of wrought iron known to ethnologists are believed to be certain sickles found by Belzoni under the base of the Sphinx at Carnac, in Thebes. Another fragment found by Captain Wise in the Great Pyramid, and the piece of a saw dug up by Layard at Nimroud, all of which are now in the British Museum, prove that iron and the art of forging were known much earlier than has been supposed, and that the secret of manipulation appears to have been held very closely for many years before it came into general use.

The oldest specimen of steel is believed to have been a Damascus blade presented by King Porus to Alexander the Great.

THE French Academy of Science at its last meeting, July 29, elected the veteran American botanist, Prof. Asa Gray, corresponding member of its botanical section, by 35 votes out of 40, Mr. Charles Darwin, the other candidate, receiving the other five.

M. MARIGNAC, a French chemist of high standing, questions the existence of Mosandrium, the supposed newly discovered elementary substance announced by Prof. J. Lawrence Smith, and named by him after Mosander, whose researches in this class of metals are well known, pronouncing it merely Terbium. Prof. Smith is good authority on these subjects, and not likely to make an announcement so easily upset.

THE article in this number entitled "Pottery found in Missouri Mounds," is condensed from Chapter IX of Mr. Conant's admirable essay upon the Archæology of Missouri in

"The Commonwealth of Missouri," and the cuts illustrating it were kindly lent us for the purpose by Mr. C. R. Barns, the editor of that fine work. The entire essay will soon be published in pamphlet form by Mr. Conant, and will form a most interesting and valuable contribution to the literature of western Archæology.

THE *Inter-Ocean* of October 3, says that Superintendent Colbert, of the Dearborn Observatory, has been making observations relative to the new planet Vulcan with the great telescope, and making calculations as to its orbit. These calculations up to yesterday morning give a synodical period of 24.774 days, giving a siderial period of 23.2 days—mean distance 0.1592, corresponding to 14,700,000 miles from the sun's center. These calculations are especially interesting, as they agree, we learn, with the following calculations of other astronomers, namely: Sidebotham, March 12, 1849; Leacerbaulb, March 26, 1859; Lummis, March 20, 1862; Weber, April 4. 1876. Also gives Tice's transit at another node, September 15, 1859, and agrees with positions as seen at Denver, July 29, 1878.

OUR friends of the Leavenworth Academy of Science have published the following attractive programme for the Winter course, viz:

October 10, The Historical Value of Linguistic Study, Prof. D. H. Robinson, of the State University; October 24, Review of some of the Modern Theories of Creation, Rev. Wm. Smith; November 7, Spectrum Analysis, W. E. Coleman; November 21, The Constitution and its History, Judge Robert Crozier; December 5, Spectrum Analysis of the Heavenly Bodies, W. E. Coleman; December 19, The Four Great Dynasties of our Planet, Rev. W. W. Backus; January 9, The Impending Revolution, W. S. Burke; January 23, Chemistry in the Arts, Prof. G. E. Patrick, of the State University; February 6, Classical Study, Prof. W. W. Grant; February 20, The Political, Educational and Religious systems of Europe and America Compared, Rev. Wm. N. Page; The Geological History of Pilot Knob, R. J. Brown; March 6th, Ethnology, Prof. H. D. McCarty; March 20, Municipal Indebtedness, Judge D. J. Brewer; April 3, The Harmony of Science and Religion, Rev. Thos. W. Barry; April 17 and May 1, Physical Geography, Tiffin Sinks, M. D.

PROF. H. CARRINGTON BOLTON, of Trinity College, Hartford, Conn., and Prof. F. W. Clarke, of the University of Cincinnati, both well-known chemists and writers, have placed us under obligations by sending us copies of articles published by them, respectively, viz: The Behavior of Natural Sulphides with Iodine and other Reagents; and On Some Seleniocyanates and the Electrolytic Estimation of Mercury; also by some very cheering and complimentary remarks upon the REVIEW and more than all, by promises of original contributions to its columns at some time not far distant.

THE following pamphlets and scientific articles have been received since our last issue, which will be hereafter published in full or in a condensed form, viz: The 205th Anniversary of the Exploration of the Mississippi River in 1673, by Marquette and Joliet, being an address by Hon. W. F. Switzler, delivered in St. Louis, July 19, 1878; Report of the Committee of the Engineers' Club of Philadelphia on the Metric System of Weights and Measures, April, 1878: An account of Holland's Hydro-carbon Retort and Oxy-hydrocarbon Illuminator; Prospectus of Strecker's Butterflies and Moths of North America, published at Reading, Pa., price $2.00; Prospectus of the American Quarterly Microscopical Journal, edited by Prof. Romyn Hitchcock, N. Y., price $3.00 per annum; Speech of Hon. Otho R. Singleton of Miss., on the Hayden Surveys; Monthly Reports of the Kansas State Board of Agriculture for May, June, July and August, 1877, filled with the most valuable statistics, by Alfred Gray, Secretary.

WE are indebted to Messrs. Houghton & Osgood for copies of the "Atlantic portraits" of the poets Bryant and Whittier. They are of life size, and similar to that of Longfellow published some three years since by the same firm, and are intended solely as premiums to subscribers to the *Atlantic*, to whom they are furnished at $1.00 each. Being faithful lifelikenesses and most excellent works of art, they make a far more appropriate ornament for a library or parlor than the chromos usually found there. Having been handsomely

framed in walnut and gilt by Findlay, these fine engravings may be seen at his store for a few days.

NOTES ON PERIODICALS RECEIVED.—Aside from the usual variety of literary articles and tales, the monthlies are all devoting a portion of their space to scientific matters. For years past *Harpers' Monthly* and *Weekly* have done this, and their "Scientific Notes and Record" are now regarded as one of the important features of both, being edited by distinguished scientists, and subsequently incorporated into Prof. Baird's Annual Record of Science and Industry. *Scribner* also makes a special department of scientific matters under the head of "The World's Work," while *Appleton's Journal* almost always has one or more well-written articles of a scientific character, and *The Atlantic* manages to make up a portion of the "Contributors' Club" by discussions of questions in some of the branches of natural history. The Eastern dailies as well as the agricultural, literary and religious journals, east and west, are also giving more and more space to such reading, and it is to be remarked that it is apparently crowding out much of the trash formerly published by them.

THE *Atlantic* for November will give its first place to a paper of unique value and interest on the Origin and Aims of the National or Workingmen's party, by the author of the powerful leading article in the October number. Mr. Brooks Adams will contribute another paper on financial conditions. The first of two essays on Florence and her great Cathedral, by Professor Charles Eliot Norton, will follow, with the conclusion of the Reminiscences of Brook Farm, a Letter from the Paris Exposition, the beginning of a new story by W. D. Howells, and a short story of Tennessee life, poems, reviews, literary essays, etc. Subscriptions received for the *Atlantic* and Portraits, also for the *Postal Guide* at this office.

THE *International Review* (A. S. Barnes & Co., N. Y.,) for September-October, contains among other excellent articles, one by Selah Merrill, archæologist of the Palestine Exploration Society, upon Pilgrim Caravans of the East, which gives one a better and more satisfactory idea of these pilgrimages to Mecca and Medina, both in their external and internal phases, than any book of travels or sketch of Eastern life we have seen.

THE critical remarks of General Millen upon Stanley's operations and discoveries in Africa are also very just and appreciative, and give, in a few pages, the full scope and outline of the great traveler's best work, "Across the Dark Continent."

THE September-October number of the *North American Review* (D. Appleton & Co., N. Y.,) contains the following articles: "Is the Reformer any longer needed?" by George W. Julian. "The Readjustment of Vocations," by William T. Harris, LL. D. "Torpedo Warfare," by D. D. Porter, Admiral U. S. Navy. "What is Inspiration?" a symposium, by Rev. F. H. Hedge, D. D., Rev. E. A. Washburn, D. D., Rev. Chauncey Giles, Rev. J. P. Newman, D. D., Most Rev. James Gibbons, D. D., Archbishop of Baltimore, and John Fiske. "Civil Service Reform," by John Jay, Chairman of the Commission on the New York Custom House. "Alfred de Musset," by T. S. Perry. "Kin beyond Sea," by the Right Hon. W. E. Gladstone, M. P. "Contemporary Literature."

Harper's Monthly for October, contains in addition to its usual variety, a most interesting account of the greatest piece of civil engineering in the world—the St. Gothard Tunnel, illustrated with fine wood cuts showing the magnificent scenery of the Swiss Alps, the intricate and ingenious machinery used in the work, and portions of the Tunnel itself. It is a description which will be read with the greatest interest by grave engineers, as well as by wonder loving readers of all ages.

THE Boston *Journal of Chemistry* is, as we have had occasion to say before, one of the best and oldest periodicals of the "popular science" class in this country. Its editorials are ably and entertainingly written upon subjects of current interest, and its general scope renders it essentially a household work, to which also its low price materially contributes.

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